Appendices

A | Online Survey and Responses

This appendix provides a questionnaire and results of a survey distributed to the general population of BART passengers and to a much larger sample of self-described bicyclists in 2011.

Total Surveys*	**4374**

1. Why do you typically ride BART?	**Number of responses**	**% of responses**
Commuting to/from work	2,662	61%
Visit friends/family	635	15%
Other	394	9%
School	173	4%
Theater or Concert	124	3%
Shopping	108	2%
Airplane trip	93	2%
Sports event	66	2%
Restaurant	35	1%
Medical/Dental	29	1%
Did Not Answer or Blank	55	1%

2. At what BART station do you typically enter at the beginning of your trips (home station)?	**Number of responses**	**% of responses**
MacArthur (Oakland)	329	8%
North Berkeley	251	6%
Ashby (Berkeley)	243	6%
Civic Center/UN Plaza (SF)	226	5%
24th St. Mission (SF)	224	5%
Rockridge (Oakland)	195	4%
16th St. Mission (SF)	184	4%
Downtown Berkeley	182	4%
19th St. Oakland	180	4%
El Cerrito Plaza	172	4%
Fruitvale (Oakland)	157	4%
Lake Merritt (Oakland)	152	3%
West Oakland	151	3%
Embarcadero (SF)	143	3%
Pleasant Hill/Contra Costa Centre	127	3%
Fremont	124	3%
El Cerrito Del Norte	95	2%
Millbrae	91	2%

2. At what BART station do you typically enter at the beginning of your trips (home station)?	Number of responses	% of responses
Dublin/Pleasanton	85	2%
Walnut Creek	84	2%
Glen Park (SF)	79	2%
12th St. Oakland City Center	71	2%
Concord	62	1%
San Leandro	61	1%
Powell St. (SF)	58	1%
Montgomery St. (SF)	53	1%
Bay Fair (San Leandro)	47	1%
Daly City	46	1%
Lafayette	46	1%
Pittsburg/Bay Point	45	1%
Union City	45	1%
Balboa Park (SF)	44	1%
Castro Valley	36	1%
Orinda	31	1%
North Concord/Martinez	30	1%
Coliseum/Oakland Airport	29	1%
Richmond	27	1%
Hayward	25	1%
West Dublin/Pleasanton	25	1%
South Hayward	22	1%
South San Francisco	21	0%
Colma	12	0%
San Bruno	10	0%
San Francisco Int'l Airport	3	0%
Did Not Answer or Blank	51	1%

3. At what BART station do you typically exit for these trips (destination station)?	Number of responses	% of responses
Embarcadero (SF)	742	17%
Montgomery St. (SF)	512	12%
Civic Center/UN Plaza (SF)	421	10%
Downtown Berkeley	297	7%
Powell St. (SF)	289	7%
16th St. Mission (SF)	250	6%
12th St. Oakland City Center	224	5%
19th St. Oakland	204	5%
Ashby (Berkeley)	110	3%
24th St. Mission (SF)	106	2%

3. At what BART station do you typically exit for these trips (destination station)?	Number of responses	% of responses
MacArthur (Oakland)	102	2%
San Francisco Int'l Airport	74	2%
Lake Merritt (Oakland)	67	2%
Millbrae	67	2%
Rockridge (Oakland)	66	2%
Coliseum/Oakland Airport	61	1%
Daly City	59	1%
North Berkeley	46	1%
Walnut Creek	43	1%
Balboa Park (SF)	42	1%
West Oakland	41	1%
Fremont	38	1%
Dublin/Pleasanton	36	1%
El Cerrito Plaza	33	1%
Pleasant Hill/Contra Costa Centre	31	1%
Fruitvale (Oakland)	30	1%
Richmond	30	1%
Glen Park (SF)	29	1%
Hayward	23	1%
Union City	22	1%
El Cerrito Del Norte	20	0%
Concord	19	0%
Lafayette	19	0%
San Leandro	19	0%
Orinda	15	0%
Bay Fair (San Leandro)	14	0%
South Hayward	13	0%
West Dublin/Pleasanton	10	0%
San Bruno	9	0%
South San Francisco	8	0%
Castro Valley	7	0%
Pittsburg/Bay Point	6	0%
Colma	3	0%
North Concord/Martinez	3	0%
Did Not Answer or Blank	114	3%

4. How far is it from your home to the BART station you typically use at the beginning of your trips?	Number of responses	% of responses
Between one and three miles	1,789	41%
One mile or less	1,609	37%
Greater than three miles	907	21%
Did Not Answer or Blank	69	2%

5. At what time do you typically enter the BART fare gates at the beginning of your trips?	Number of responses	% of responses
7:00-9:00am	2,031	46%
After 9:00am	1,714	39%
Before 7:00am	542	12%
Did Not Answer or Blank	87	2%

6. How do you typically get to your home BART station?	Number of responses	% of responses
Bike	2,166	50%
Walk all the way to BART	886	20%
Drive or carpool	803	18%
Public transit	317	7%
Dropped off	84	2%
Other	59	1%
Did Not Answer or Blank	59	1%

7. What level of bicyclist do you consider yourself to be?	Number of responses	% of responses
Advanced	1,563	36%
Intermediate	1,411	32%
Beginner	193	4%
Did Not Answer or Blank	1,207	28%

8. Why do you bike to BART (please check all that apply).	Number of checks
Most convenient travel option	2,292
Healthy/for exercise	2,192
Good for environment	2,024
Don't own a vehicle/don't drive	973
Difficult to find parking	817
Convenient/safe bike parking	603
Parking too expensive	577
Other	317
Did Not Answer or Blank	N/A

9. Do you typically park your bike at the BART station or do you bring your bike onboard?	Number of responses	% of responses
Bring bicycle onboard train	1,720	39%
Park bicycle at station	787	18%
It varies. Please explain:	684	16%
Did Not Answer or Blank	1,183	27%

10. What are the reasons you bring your bike onboard (check all that apply)	Number of checks
Need or want bike on other end	2,205
Don't feel safe leaving bike at station all day	1,154
Will not be returning to the station at which I first boarded	611
Other	139
Did Not Answer or Blank	N/A

11. Rate bike routes on city streets and/or pathways to/from station	Number of responses	% of responses
Good	1,280	29%
Adequate	1,159	26%
Poor	347	8%
Outstanding	261	6%
Did Not Answer or Blank	1,327	30%

12. Bike parking suppy (amount) at your station	Number of responses	% of responses
Adequate	1,023	23%
Good	870	20%
Poor	744	17%
Outstanding	331	8%
Did Not Answer or Blank	1,406	32%

13. Bike parking location at your station	Number of responses	% of responses
Good	1,056	24%
Adequate	821	19%
Poor	601	14%
Outstanding	485	11%
Did Not Answer or Blank	1,411	32%

14. Presence of attended bike parking (i.e. Bike Station at Downtown Berkeley or Fruitvale stations)	Number of responses	% of responses
Not Applicable (no attended bike parking)	2,194	50%
Outstanding	248	6%
Good	230	5%
Poor	162	4%
Adequate	153	3%
Did Not Answer or Blank	1,387	32%

15. Lighting around bike parking at your station	Number of responses	% of responses
Adequate	1,227	28%
Good	1,012	23%
Poor	469	11%
Outstanding	222	5%
Did Not Answer or Blank	1,444	33%

16. Security of bike parking at your station	Number of responses	% of responses
Poor	1,152	26%
Adequate	882	20%
Good	613	14%
Outstanding	275	6%
Did Not Answer or Blank	1,452	33%

17. Signs to locate bike parking at your station	Number of responses	% of responses
Adequate	823	19%
Poor	744	17%
Good	681	16%
Not Applicable (none at my station)	544	12%
Outstanding	115	3%
Did Not Answer or Blank	1,467	34%

18. Getting bike from street level to bike parking	Number of responses	% of responses
Parking is on street level	911	21%
Adequate	654	15%
Good	577	13%
Poor	486	11%
Outstanding	313	7%
Did Not Answer or Blank	1,433	33%

19. Getting bike from street level to platform	Number of responses	% of responses
Adequate	1,269	29%
Poor	930	21%
Good	481	11%
Not Applicable	265	6%
Outstanding	55	1%
Did Not Answer or Blank	1,374	31%

20. In your opinion, should bikes be allowed on escalators?	Number of responses	% of responses
Yes, when lack of crowding permits it	1,403	32%
Yes, at all times	815	19%
Never, consistent with the current rules	421	10%
Yes, during off-peak periods	397	9%
Did Not Answer or Blank	1,338	31%

21. Are you familiar with the "stairway channel" at the 16th Street BART station?	Number of responses	% of responses
Yes	1,594	36%
No	1,460	33%
Did Not Answer or Blank	1,320	30%

22. Have you ever used the stairway channel at 16th Street to wheel your bicycle up or down the stairs?	Number of responses	% of responses
Yes	1,108	25%
No	487	11%
Did Not Answer or Blank	2,779	64%

23. What do you find to be the most convenient and easiest way to transport your bicycle between levels at the 16th Street BART station?	Number of responses	% of responses
Use the stairway channels	490	11%
Carry it on the stairs	477	11%
Use the elevator	94	2%
I don't use the 16th Street BART station	0	0%
Did Not Answer or Blank	3,313	76%

24. Which type of bicycle parking do you prefer? Please rank the types (lower is better)	Ranking
Attended Bike Station (such as Downtown Berkeley and Fruitvale)	2.26
BikeLink electronic lockers (shared use)	2.64
Bike racks inside the paid area	2.86
Self-serve Bike Station (such as Embarcadero and Ashby)	2.87
Keyed bicycle lockers (personal locker)	3.53
Bike racks outside the paid area	4.68
Did Not Answer or Blank	N/A

25. Are you familiar with electronic lockers/BikeLink?	Number of responses	% of responses
Yes	1,620	37%
No	1,089	25%
Did Not Answer or Blank	1,665	38%

26. Do you ever use electronic lockers/BikeLink?	Number of responses	% of responses
No	1,772	41%
Yes	927	21%
Did Not Answer or Blank	1,675	38%

27. How easy or difficult do you find using electronic/BikeLink lockers?	Number of responses	% of responses
Extremely easy	471	11%
Moderately easy	378	9%
Somewhat difficult	69	2%
Very challenging	17	0%
Did Not Answer or Blank	3,439	79%

28. How possible is it for you to get to BART by bicycle?	Number of responses	% of responses
Very possible	390	9%
Not possible	264	6%
Somewhat possible	157	4%
Slightly possible	124	3%
Did Not Answer or Blank	3,439	79%

29. Please indicate how much each factor prevents you from bicycling to BART.	Ranking
Not enough space for bikes on train cars (no bike racks, crowds)	5.42
The ban on bringing bikes aboard trains in peak-period/direction	5.39
Poor weather	4.57
Don't own a bicycle	4.34
Lack of secured/covered/lighted parking	4.20
Lack of bike lanes or paths on my route to BART	4.19
Difficulty getting bike through station	4.08
Too far between home and station	4.05
Poor road conditions (potholes, unsafe streets)	3.93
Don't feel comfortable riding a bicycle	3.71
No changing rooms/showers at work	3.70
Not enough bike parking	3.69
Need to run errands before/after work	3.59
Too many hills	3.38
Lack of signage showing where bike parking is, where elevators are, etc.	3.17
Inconvenient location of bike parking	3.04
Dangerous car parking configurations/driveways	2.94
Need to pick up/drop off children	2.19
Don't know how to ride a bicycle	1.81
Did Not Answer or Blank	N/A

30. Which one factor from the list above presents the most significant obstacle?	Number of responses	% of responses
Don't own a bicycle	176	4%
Too far between home and station	150	3%
The ban on bringing bikes aboard trains in peak-period/direction	143	3%
Don't feel comfortable riding a bicycle	98	2%
Lack of secured/ covered/lighted parking	60	1%
Not enough space for bikes on train cars (no bike racks, crowds)	54	1%
Too many hills	41	1%
Poor road conditions (potholes, unsafe streets)	36	1%
Not enough bike parking	28	1%
Need to pick up/drop off children	25	1%
Lack of bike lanes or paths on my route to BART	23	1%
Need to run errands before/ after work	22	1%
Difficulty getting bike through station	21	0%
No changing rooms/showers at work	21	0%
Poor weather	14	0%
Dangerous car parking configurations/ driveways	5	0%
Lack of signage showing where bike parking is, where elevators are, etc.	3	0%
Inconvenient location of bike parking	2	0%
Did Not Answer or Blank	3,452	79%

31. Which of the following would make it more likely you would bike to BART?	Ranking
Ability to bring bikes on trains at all times	7.88
Protected pathways and bike lanes leading to BART stations	6.74
More secured/covered bike parking (Bike Stations, electronic lockers)	6.47
Easier bike access through stations (wider fare gates, stairway channels, etc.)	6.09
More conveniently located bike parking (near station agents/fare gates for visibility and security)	5.88
More bike parking	5.17
Shared bikes available for rent at stations	4.52
More in-station amenities (groceries, errands) to reduce need to travel long distances for essentials	3.90
Increased car parking fees at stations to reduce attractiveness of driving to station	3.83
A program to try folding bikes or purchase at discount	3.71
Did Not Answer or Blank	N/A

32. What is your age?	Number of responses	% of responses
25-34	1,272	29%
55-64	433	10%
18-24	263	6%
65 and older	107	2%
13-17	13	0%
12 or younger	0	0%
35-44	0	0%
45-54	0	0%
Did Not Answer or Blank	2,286	52%

33. What is your gender?	Number of responses	% of responses
Male	1,957	45%
Female	1,560	36%
Other	37	1%
Did Not Answer or Blank	820	19%

34. What is your annual household income?	Number of responses	% of responses
$100,000 - $149,999	658	15%
$50,000 - $74,999	638	15%
$25,000 - $49,999	598	14%
$75,000 - $99,999	574	13%
$150,000 - $199,999	320	7%
Under $15,000	214	5%
$15,000 - $24,999	206	5%
$200,000 - and over	0	0%
Did Not Answer or Blank	1,166	27%

* Simple frequency results from combined open (primarily cyclists) and invitation (general BART riders) surveys. For a breakdown of responses by primarily cyclist riders and general BART riders, see [insert URL].

B | Bike Station survey and responses

On the following pages is the survey administered to users of BART's two attended bike stations, followed by the survey responses.

Please take a few minutes to complete this survey about your use of the Bike Station. Return your completed survey to the box by the attendant. Thanks.

1) When did you first start using the Bike Station to park your bike?

- ☐ Within the past month
- ☐ 1—6 months ago
- ☐ More than 6 months ago

2) How many days per week do you currently leave your bike at the Bike Station?

- ☐ 6-7 days per week
- ☐ 5 days per week
- ☐ 3-4 days per week
- ☐ 1 - 2 day per week
- ☐ 1-3 days per month
- ☐ Less than once per month

3) How often do you leave your bike overnight at the Bike Station?

- ☐ 6-7 days per week
- ☐ 5 days per week
- ☐ 3-4 days per week
- ☐ 1 - 2 day per week
- ☐ 1-3 days per month
- ☐ Less than once per month
- ☐ Never

4) When you leave your bike at the Bike Station, where are you normally going? *(check one)*

- ☐ Home
- ☐ Work
- ☐ School
- ☐ Medical/Dental
- ☐ Shopping
- ☐ Airport
- ☐ Sports Event
- ☐ Restaurant
- ☐ Theater or Concert
- ☐ Visit friend(s)
- ☐ Other: _____

5) Do you normally use BART in combination with your use of the Bike Station?

- ☐ No
- ☐ Yes

6) If the Bike Station was not available for you to park your bike, which of the following would you most likely do? *(check one)*

- ☐ Ride your bike to the same area but park elsewhere
- ☐ Ride your bike and take it on BART rather than parking
- ☐ Ride your bike all the way to your destination
- ☐ Ride to a different BART station
- ☐ Not ride your bike at all
- ☐ Not ride your bike as often
- ☐ Other: _____

. . . more on the back . . .

7) Did the option to park at the Bike Station . . . *(check one)*

- ☐ make it more likely you would ride your bike for this trip
- ☐ not change the likelihood of using your bike for this trip

8) In general, how satisfied are you with the service provided by the Bike Station?

- ☐ Very satisfied
- ☐ Somewhat satisfied
- ☐ Neutral
- ☐ Somewhat dissatisfied
- ☐ Very dissatisfied

Why is that?: _____

_____

9) Are you familiar with the BikeLink Card?

- ☐ No
- ☐ Yes

→ **If yes, do you have a BikeLink Card?**

- ☐ Yes
- ☐ No

10) Your home ZIP Code: ____ ____ ____ ____ ____

11) Your age

- ☐ 12 or younger
- ☐ 13-17
- ☐ 18-24
- ☐ 25-34
- ☐ 35-44
- ☐ 45-54
- ☐ 55-64
- ☐ 65+

12) Gender

- ☐ Female
- ☐ Male

13) Comments or suggestions for improving the Bike Station?

_____

_____

_____

14) Can we contact you in the future to ask you opinion about the Bike Station or BART?

- ☐ No
- ☐ Yes

→ **If yes, please provide you first name and an email address:**

Name: _____

Email:_____@_____

Thanks for completing the survey and for riding your bike.

Bike Station Survey Responses

	Berkeley		Fruitvale		Combined	
1) When did you first start using the Bike Station to park your bike?						
Within the past month	3	5%	7	8%	10	7%
1—6 months ago	19	35%	11	13%	30	21%
More than 6 months ago	33	60%	70	80%	103	72%
	55	100%	88	100%	143	100%
2) How many days per week do you currently leave your bike at the Bike Station?						
6-7 days per week	1	2%	2	2%	3	2%
5 days per week	24	44%	36	41%	60	42%
3-4 days per week	18	33%	30	34%	48	34%
1 - 2 day per week	7	13%	10	11%	17	12%
1-3 days per month	5	9%	8	9%	13	9%
Less than once per month	0	0%	2	2%	2	1%
	55	100%	88	100%	143	100%
3) How often do you leave your bike overnight at the Bike Station?						
6-7 days per week	1	2%	0	0%	1	1%
5 days per week	0	0%	1	1%	1	1%
3-4 days per week	2	4%	2	2%	4	3%
1 - 2 day per week	1	2%	0	0%	1	1%
1-3 days per month	7	13%	15	17%	22	15%
Less than once per month	20	36%	27	31%	47	33%
Never	24	44%	43	49%	67	47%
	55	100%	88	100%	143	100%
4) When you leave your bike at the Bike Station, where are you normally going? *(check one)*						
Home	2	3%	5	6%	7	5%
Work	44	67%	69	80%	113	74%
School	4	6%	6	7%	10	7%
Medical/Dental	0	0%	1	1%	1	1%
Shopping	3	5%	0	0%	3	2%
Airport	0	0%	1	1%	1	1%
Sports Event	0	0%	0	0%	0	0%
Restaurant	3	5%	3	3%	6	4%
Theater or Concert	1	2%	0	0%	1	1%
Visit friend(s)	2	3%	0	0%	2	1%
Other: _____	7	11%	1	1%	8	5%
	66	100%	86	100%	152	100%

	Berkeley		Fruitvale		Combined	
5) Do you normally use BART in combination with your use of the Bike Station?						
No	15	27%	7	8%	22	15%
Yes	40	73%	81	92%	121	85%
	55	100%	88	100%	143	100%
6) If the Bike Station was not available for you to park your bike, which of the following would you most likely do? *(check one)*						
Ride your bike to the same area but park elsewhere	16	26%	15	17%	31	21%
Ride your bike and take it on BART rather than parking	8	13%	23	26%	31	21%
Ride your bike all the way to your destination	3	5%	4	5%	7	5%
Ride to a different BART station	6	10%	2	2%	8	5%
Not ride your bike at all	7	11%	21	24%	28	19%
Not ride your bike as often	11	18%	15	17%	26	17%
Other: _____	10	16%	8	9%	18	12%
	61	100%	88	100%	149	100%
7) Did the option to park at the Bike Station . . . *(check one)*						
make it more likely you would ride your bike for this trip	39	74%	77	93%	116	85%
not change the likelihood of using your bike for this trip	14	26%	6	7%	20	15%
	53	100%	83	100%	136	100%
8) In general, how satisfied are you with the service provided by the Bike Station?						
Very satisfied	54	100%	82	99%	136	99%
Somewhat satisfied	0	0%	1	1%	1	1%
Neutral	0	0%	0	0%	0	0%
Somewhat dissatisfied	0	0%	0	0%	0	0%
Very dissatisfied	0	0%	0	0%	0	0%
	54	100%	83	100%	137	100%
9) Are you familiar with the BikeLink Card?						
No	17	32%	68	82%	85	63%
Yes	36	68%	15	18%	51	38%
	53	100%	83	100%	136	100%
If yes, do you have a BikeLink Card?						
Yes	19	51%	5	36%	24	47%
No	18	49%	9	64%	27	53%
	37	100%	14	100%	51	100%

	Berkeley		Fruitvale		Combined	
10) Your home ZIP Code:						
11) Your age						
12 or younger	0	0%	0	0%	0	0%
13-17	1	2%	4	5%	5	4%
18-24	6	11%	5	6%	11	8%
25-34	22	41%	17	20%	39	28%
35-44	7	13%	26	31%	33	24%
45-54	9	17%	19	23%	28	20%
55-64	7	13%	10	12%	17	12%
65+	2	4%	2	2%	4	3%
	54	100%	83	100%	137	100%
12) Gender						
Female	27	52%	26	33%	53	40%
Male	25	48%	53	67%	78	60%
	52	100%	79	100%	131	100%

C | Summary of focused group discussions

In May 2011, four focused group discussions – with a total of 40 participants – were conducted with B ART passengers who bicycle for other trips, but who, for the most part, currently drive to BART. Responses are reported in this appendix in four sections, listed below. (Numbers indicate number of participants who made each comment. No number indicates one comment.)

- Challenges to bicycling to BART and suggested solutions
- Preference for short term or long term bicycle parking
- Preference for onboard bicycle accommodation
- Anticipated effectiveness of various strategies at increasing rate of bicycle access to BART

Challenges to bicycling to BART and suggested solutions

Challenge	Solution
On-site	
Security/Theft	
• Security problems/thefts at Millbrae/Bayfair/Lake Merritt Stations, now nervous to bring a bike and usually drive • Coliseum Station very dangerous, location of bike parking not safe…73rd Ave is a very dangerous access street (5) • Fear of theft at stations results in either bringing bike on board or not biking at all (don't need it on other end but take bike anyway for fear of theft)…don't want to leave bike outside in open racks (6) • Leaving bike in a rack, especially when other bikes are noticeably damaged, does not create peace of mind (4)	• Bayfair Station needs security cameras to protect stored bikes • Better lighting and location/visibility of bike parking could help aid in safety (police not enough) (4) • Bike parking at Coliseum station should be located near employee parking • Lafayette has great bike racks, but in an unsupervised location • More police protection needed at bike lockers/racks… cameras not enough • Protected BikeStations good for peace of mind
Burdensome to Get Bike Through Station	
• Carrying bike up/down stairs not easy (can't bring bike on escalators) (7) • Stairways very narrow for a bike, especially when crowded • Big logistical issue of going through elevator and then having to go back to pay fare • Elevators at stations very narrow and often not working, can't bring 2 bikes on them at once (2) • Narrow faregates difficult to get bike through	• Need stairway channels (4) • Wide faregates work well to accommodate bikes • Some stations (North Berkeley, Walnut Creek) have a faregate near elevator so you don't have to go back out to pay • Bikes should NOT be on escalators during peak times because it's not respectful, too large…but if it's not peak hours then people should be able to • Maintained elevators/wide elevators (Dublin/Pleasanton a good example) (4) • Cyclists bringing bikes up stairs can be disruptive, need signs to alert all passengers to stay on the right • Signs in station to inform of proper bike etiquette (4)
Bike Parking/Storage	
• Not enough bike parking in downtown SF stations…would be nice if office buildings had more parking	• BikeLink parking is excellent, very cheap and secure, need more (Lake Merritt Station) (3)

Challenge	Solution
• Not enough information on where to park bikes/how storage works...need more signage (4) • Fruitvale BikeStation closes at 8pm and not open on weekends • Lockers always full (Concord/Macarthur Stations) • Very fact that you have to be on a wait-list for a locker is an incentive to NOT let it go, whether it is used or not	• Need covered bike parking for rain and heat protection • More parking needed at end-destination stations, such as downtown Oakland and San Francisco stations • Need to be able to use Clipper on BikeLink/eLockers • BikeStation in Fruitvale excellent, should be model for other stations (4) • Bike-share programs • eLockers should have number of spaces available online, like car parking (knowing a bike parking spot is available would be a deterrent from driving and aid in flexibility) • Better signage alerting rider of where bike parking is located, perhaps near elevators and faregates (Civic Center Station cited as example of where this is needed) • More information on how to use eLockers
Automobile parking supply and fees	
• Depending on time of day, driving/parking is more convenient at Fremont BART than biking • To reach Fremont bike parking, need to mix with cars, risk getting cut off by taxis and ride through parking spaces reserved for disabled passengers in order to reach bike parking (2) • Motivated to bike because auto parking lot is full	• Stations could have small stores for groceries/errands to avoid having to drive after work for daily tasks, and would bring more people to station for sense of security (3) • Bike lanes through parking lot needed

Systemwide Policies/Train Car Issues

Time of Day/Rush Hour Ban	
• Limited by what train to ride (bike ban during rush hour)...always have to plan ahead, not a supportive system, especially for children (5) • Rush hour limitation of bringing bike on board coupled with poor security at Bayfair Station means I drive	• Better PR lately about allowing bikes on trains...network with local bike groups (Easy Bay Bicycle Coalition) to get word out that bikes are welcome on BART • Extend bike hours
Lack of Space on Cars/Crowds	
• Passengers can be very rude toward bicyclists (4) • Not enough space on trains in rush hour, don't want to burden other passengers...worried train will be full when only a four car train on Fremont-Richmond line (5) • Need to stand a long time if bike is taken on-board, no special seating for bicyclists • Intimidated to bring bike on board because of overall difficulty...belief that only hardcore cyclists bring bikes on BART • Modifying work schedule to avoid rush hour ban not very practical because most have set work hours • 40-year-old train cars do not fit modern world's amount of	• New train cars with pictures of where bikes are supposed to go ("Bike Space") are very helpful and show people that bikes belong...helps overcome non-bike passenger resistance towards bikes (3) • Consistency in enforcement of bike rules by police, station agents, and train operators (example: train operators inconsistently enforce blackout periods, and have widely varying approaches to enforcing the first car prohibition)) (4) • Both non-cyclists and cyclists need to understand the rules for bringing a bike on board (2) • Since existing rules are rarely enforced, additional ones

Challenge	Solution
stuff people bring on trains	won't help • Suggestion: total bike car at all times, nobody else (Caltrain a good example) (4) • Disadvantage: still time limited, not knowing where first/last car are • Advantage: community of cyclists • Cyclists need to be more cognizant of how much space they are taking on the train (2) • More seats should be taken out of train cars to allow for additional bike space, especially bike racks (also helpful for people with luggage and strollers/wheelchairs) • More on-train information about what station you are at/approaching (NYC, Muni good examples) • Butt-rails to lean on when standing/holding bike (common in France) • Bike-only cars should be adjacent, not first and last, so if one car is full people, can access the other without running down the platform • Bringing bike on weekends is fine because less crowding
	Other Solutions • Fare discount/incentives for bike riders • Free bike experts at BART stations for repairs/questions • Get rid of carpet on trains!

Off-site Access

Hills/Weather/Environmental Issues

- Hills mentioned as a barrier to access Bayfair, Castro Valley, Powell Stations by bike
- Would bike more but weather/things to carry an inhibitor (5)
- Messing up hair/clothes (no showers/facilities at work)
- Darkness at night a deterrent from riding, especially on access trails in more rural BART areas (Lafayette-Moraga Trail has animals at night)

City Streets

- Would bike more but distance between Livermore and Dublin/Pleasanton Station about 10 miles and no good path
- Bay Area streets not set up for bicyclists as compared with other areas (Seattle mentioned)…too many gaps in the biking network (Lafayette Station cited) (3)
- Potholes prevalent on city streets
- Walnut Creek Station very dangerous to bikes…cars coming in all directions on arterial streets, bike paths
- Fremont Station needs bike lanes to access station
- Need more dedicated lanes on city streets leading to stations in areas not dominated by cars…Orinda/Dublin Stations are good examples, San Leandro/Bayfair need help
- 40th Street in Oakland a very busy road even with bike lane, so bike a circuitous route to Macarthur Station on less busy streets…most direct path not necessarily the most bike-friendly

Challenge	Solution
inferior compared with Lafayette • Transbay Terminal construction messing up streets in downtown SF, difficult to navigate street closures • Fremont Station very difficult to access bike…need to ride through parking lot or through bus lanes/cab stand • Destination is not walkable…biking is only option on other end • Some bike paths (Clayton Rd) too narrow to ride (2)	• BART shuttles with bike racks to bring passengers to stations (like Emery-Go-Round)

Other Public Transit Concerns

- Not enough bike space on Muni buses (only 2 front racks)

Preference for short term or long term bicycle parking

Participants were told: "Currently BART offers two general types of bike parking:

1. Bike racks usually near the station entrance and sometimes even in the paid area of the station. You bring your own lock, it's quick, it's pretty simple.
2. Bike lockers and bike stations (group parking facilities). To use these you need to purchase a Smartcard (BikeLink), check yourself in and out and pay approximately 3 cents per hour. A little more effort on your part but an extra level of security."

They were then asked which type they prefer and why:

- **Bike Racks:** 1 vote
  Comments:
  - Nice to be able to get in/out quickly
- **Bike Lockers/stations:** 37 votes
- **No response:** 2 votes

Preference for onboard bicycle accommodation

Participants were told: "In a time of increasing ridership without peak period/peak direction capacity increases foreseen, BART is trying to find ways to better accommodate bikes onboard trains, while minimizing impacts on wheelchair users and other BART riders. How would you feel about a concept that would allow bicycles on the first and last car of every train only, but with these cars outfitted with bicycle racks that could accommodate multiple bikes comfortably versus continuing the current approach of allowing bikes on every car but the first car, with some cars having some extra open space for wheelchairs, bikes, luggage, and strollers to share as needed?

- **Bikes on first/last car with racks:** 7 votes
  Comments:
  - Still time limited
  - Could help foster a biking "community"
  - Fear of too much crowing on cars…who has priority?
  - Cars should be reserved only for bicyclists (3)
  - Could make it harder to share space with other passengers
  - Wouldn't funneling all cyclists into one or two cars extend dwell times?
- **Bikes on adjacent cars:** 12 votes (would prevent running through station to get to other end if one car is full)
- **Bikes on every car except the first, but with extra space:** 18 votes
  Comments:
  How would BART ensure there is space? Same problem today
  Spreads bikes out rather than crowding into 2 cars
  Should be section on each car for bikes
  Want dedicated space but on every car
  Could also help luggage and wheelchair users

Anticipated effectiveness of various strategies at increasing rate of bicycle access to BART

Strategy	Ranked choice #1	#2	#3
More bike parking	1	4	5
More secure bike parking	18	8	7
Covered bike parking	1	3	5
More conveniently located bike parking	2	1	4
Protected bike lanes on city streets leading to BART stations	6	9	8
Increased car parking fees at station lots to reduce attractiveness of driving to station	2	0	1
More in-station amenities (groceries, errands) to reduce need to travel long distances for essentials	5	7	2
Ability to bring bikes on trains at all times	11	9	3

D | Summary of advocate & BPAC meetings

This appendix contains a list of suggested improvements to BART stations and station areas suggested by representatives of countywide bicycle advocacy groups and countywide Bicycle Advisory Committees throughout BART's service area.

Countywide advocacy group comments

East Bay Bicycle Coalition meetings, 5/27/11 and 6/1/11

Issues Specific to Contra Costa County BART Stations

Pittsburg/Bay Point

On-station/parking issues

- Difficult to get a bike through station to platform, have to go up stairs or two elevators, a major deterrent

Off-station access issues

- Need a bike signal, better signage, and safe crossing for bikes/pedestrians at intersection between station/Hwy 4 off-ramp/Bailey Rd/ Delta de Anza Trail
- Put a two-way bike trail along the north side of the station to connect to De Anza Trail and overcome the Bailey Road intersection
- Pittsburg has a bike lane planned on Bailey Rd, as well as a major redesign plan for Bailey
- Need bike lanes and sharrows on the 4-lane entrance-exit road to the Station from Bailey Road
- If bicycles are suggested to use the sidewalk instead, then the pinch point near the station should be widened
- Have buses stop 15 or 20 feet farther into the station area and leave the curb cut accessible to bikes
- It is excessive to add one more automobile entrance/exit to the station parking area along West Leland Road

North Concord

Off-station access issues

- Bike path along BART right-of-way/Port Chicago Highway
- An asphalt path along Panoramic Drive needs a curb cut (48' wide curb-to-curb street)
- Bike lanes need to be added to Panoramic Drive, the street in front of the Station.
- Finish the sidewalk and trail along the east side of Port Chicago Highway
- Need signage to and along Delta-de Anza trail bike route

Concord

On-station/parking issues

- Only station in system to have a cell phone-operated eLocker system but rarely used

Off-station access issues

- More signage needed to alert bicyclists of where routes are/where parking is at station

Pleasant Hill

On-station/parking issues

- Future bike garden/pavilion will be at south end of the station
- Some bike parking spaces were moved for station construction one week before Bike to Work Day...better communication needed

Off-station access issues

- Jones Road bridge of the Iron Horse Trail entry point to BART station needs more signs to alert drivers along Jones Rd of bicyclists...currently has different color crosswalk but more needed
- North entrance to station off Jones Rd/Iron Horse Trail has no treatment, bicyclists have to cross street and end up in bus lanes
- 10pm curfew on Iron Horse Trail by EBRPD an issue for night cyclists
- Treat Blvd overcrossing above I-680 not pedestrian/bike friendly...no bike lanes, problem with dense housing planned on other side of freeway
- Oak Road has no bike lanes
- Pleasant Hill BART Shortcut Path will cut off 3/4-1 mile to station...CCTA needs to step in and oversee

project, in planning stages for 6 years (police and maintenance jurisdiction are big issues)
- The Canal Trail requires out-of-direction travel.

Other issues
- Closest station to Diablo Valley College (4 miles)
- Known as a theft-rich station

Walnut Creek

On-station/parking issues
- Anecdotally known as a theft-rich station
- Major TOD planned in existing parking lots

Off-station access issues
- Oakland/Hwy 24 off-ramp/Ygnacio Valley Road intersection (redesign project in 2001) a major problem for cyclists trying to cross from existing bike path (under BART right-of-way) into the station, where the bike parking currently exists
- Need to ride bikes in the opposite direction as buses or along sidewalk to get to station from YVR/N. California Blvd intersection station entrance; a safer route is needed.
- Ygnacio Valley Road very dangerous for cyclists trying to get to Iron Horse/Canal Trails
- Sidewalks with "Bikes May Use Sidewalk" signs should be increased to 10 feet wide.
- Need better connections to west side of I-680
- Sharrows or a lane needs to be added through the parking area
- Make wider, direction-specific curb-cuts at the intersections,
- Mitigate the limited-sight-distance intersection at the court parking lot.

Lafayette

On-station/parking issues
- More bike parking needed along the south side of the station, but be mindful of lighting/security issues of putting bike parking in desolate spaces
- Bike parking could also be put inside station fare gates but would require going up stairs
- Poorly built stairway channel (new)

Off-station access issues
- Wheelchair access being built, used by cyclists to get to Downtown Lafayette, needs a curb cut
- Bike lanes needed on Happy Valley but on-street car parking would need to be removed
- Mount Diablo Blvd now has a sharrow
- Deer Hill Road has a great bike signal, should be used as an example for other sites

Orinda

On-station/parking issues
- Large number of people on wait-list for lockers, but eLockers coming
- Stairway at northwest corner of station should be replaced with a ramp

Off-station access issues
- Camino Pablo undercrossing very dangerous for cyclists with blind corners and sightlines
- Improve signage from St. Stephens to station
- Improve sight lines on Camino Pablo undercrossing
- ADA ramp needed east of station to downtown Orinda
- Need bike lanes on Bryant Way for cyclists accessing St. Stephens trail, will require removing auto parking

Richmond

On-station/parking issues
- Major development slated for the east side of the station, similar to what has been done at the west side
- West side of station needs stair channels
- Good location for bike parking...near the station agent

Off-station access issues
- Bike lane project on Barrett Ave, as well as streetscape project for 23rd Street in the works
- Signage needed from station to bike route to Kaiser Hospital
- Connection problem from station to Richmond greenway

El Cerrito del Norte

Off-station access issues
- Four-way stops needed at Ohlone Greenway and Hill/Cutting intersections
- San Pablo/Cutting/Eastshore Blvd intersections very dangerous for bicyclists (and pedestrians)

El Cerrito Plaza

On-station/parking issues
- Reports of malfunctioning eLockers

Off-station access issues
- Intersections of Ohlone Greenway and Central/Fairmont need 4-way stops
- Overall a quality station for bike accessibility

Future Antioch eBART

Off-station access issues

- Station will require crossing Highway 4 on the Hillcrest Avenue overcrossing.
- Consider a pedestrian-bicycle bridge over the freeway east of the station to eliminate the need for crossing the on-ramp in question.

Issues Specific to Alameda County BART Stations

Rockridge

On-station/parking issues

- Possible plans for a Bike Station
- Should have a higher bike parking utilization, perhaps low because of poor locations of bike parking
- The only parking spot with high demand is at the bottom of the stairs on street level because it has the most eyes and perhaps is used by non-BART riders in neighborhood
- Add more lighting in front of elevator at ground level

Off-station access issues

- Cars drive very fast along College Ave under the freeway...very dark and unwelcoming for bikes, pedestrians, and car
- Bike lanes needed on Keith Ave
- Need signage to get to Webster/Shafter bike route from station

North Berkeley

On-station/parking issues

- Ramp to bike parking needs to be improved on the south side of the station
- Good station elevator...has its own fare gate
- Should open up the station dome to see through the station
- Bike theft known to be a problem
- Personal safety of bike lockers in unattended spaces at night

Off-station access issues

- Needs signs to station from Ohlone Greenway in Albany
- Four-way stop needed at Virginia and Sacramento intersection

Downtown Berkeley

On-station/parking issues

- Stairway channels needed
- Some parking at the north side of the station was removed and placed at Macarthur
- Need to promote BikeLink at station

Ashby

On-station/parking issues

- Great bike station design, but perhaps should be easier to see through more personal security (has a panic button)

Off-station access issues

- Bike access from Woolsey needs signage because Ed Roberts Campus now blocks station entrance
- No obvious way to get from station to Milvia bikeway, the main bike access route to downtown Berkeley

Macarthur

On-station/parking issues

- Transit Village now under construction
- Bike Station will be built with good design concepts

Off-station access issues

- Bike lanes needed on 40th/Macarthur/Martin Luther King/Telegraph

19th Street

On-station/parking issues

- Double-decker bike racks are excellent
- The elevator at street level has no sign and is very hidden...need a map of where it is in the station and on street
- Stairway channels needed

12th Street/Oakland City Center

On-station/parking issues

- Stair channels needed
- Talk of putting a Bike Station at City Center, but would it be better to put it at 19th Street Station? BART needs to be part of this conversation
- Parking currently at concourse level
- Office buildings have bike parking, but it is bad so most people park bikes at station

West Oakland

Off-station access issues

- Planned improvements on 7th Street near the station will improve bike access
- Clear bike access points

Lake Merritt

On-station/parking issues

- Stairway channels needed
- Has lots of bike parking but needs more eLockers (all occupied)

Off-station access issues

- Perhaps a counterflow bike lane on all the one-way streets?

Fruitvale

On-station/parking issues

- Has excellent bike parking

Off-station access issues

- Needs a clear path and curb cuts to get to 34th Avenue...all roads in the area leading east are challenging for bicyclists
- A two-way bikeway is needed between 33rd Avenue and San Leandro Blvd
- Fruitvale Avenue is the main route taken by all residents of Alameda to get to station

Coliseum/Oakland Airport

On-station/parking issues

- Bike parking on the east side of the station very uninviting

Off-station access issues

- Not known how to get to Hegenberger Rd, needs signage
- Need signage/routes to East Bay Greenway
- Personal safety inside station and on city streets leading to station a huge problem

San Leandro

Off-station access issues

- Verify that city improvements don't affect West Juana and Estudillo Avenues, which are major walk/bike routes to downtown
- Pedestrian crossing needed over railroad
- Opportunities for improved bike access from redevelopment
- Davis/San Leandro/Alvarado all slated for new bike lanes

Bayfair

Off-station access issues

- Safe Routes to Transit grant for personal security lighting, sight lines
- Tunnel to west side of tracks
- Coelho Drive tunnel has no bike lanes
- Hesperian Blvd has bike lanes

Hayward

Off-station access issues

- Main issue C Street tunnel goes through the station and needs to be more bike-friendly
- Bike/ped crossing at railroad (same problem as San Leandro)
- East side of station has bike parking, needs some on west side
- Overall not a bad station for biking

South Hayward Station

No comments

Union City

On-station/parking issues

- Has TOD been accompanied by more bike parking at the station?

Off-station access issues

- What are the plans to cross railroad tracks to/from future TOD?
- Decoto has bike lanes but adjacent to BART parking lot
- Is issue of BART passengers parking cars in bike lane solved?

Fremont

On-station/parking issues

- Parking lot comfortable for bikes

Off-station access issues

- Warm Springs opportunity for trail to sports fields
- Walnut Avenue improvements

Castro Valley

Off-station access issues

- Station only bike accessible from north side
- Redwood Road is bad to ride on
- Needs signage from Castro Valley Blvd and Wilbeam Ave
- Redwood undercrossing under I-580 has no bike lane; only accessible from south (see County Bike Plan for plans to address)

West Dublin/Pleasanton

Off-station access issues

- To access bike parking from Golden Gate Drive, have to walk over north walkway, walk through the

station, head down the south walkway to south side of station
- Dublin Blvd at I-680 has no bike lanes
- Stoneridge Mall Rd has no bike lanes
- Gap in bike lanes between Pleasanton and San Ramon

Dublin/Pleasanton

On-station/parking issues

- Signs posted saying not to ride in parking lot
- Excellent location of bike parking, there needs to be more
- Photo opportunity of bikes locked to light stands and railings
- From station to Iron Horse Trail no curb cut so cyclists stay on sidewalk

Off-station access issues

- TIGER II projects
- Owens Drive has no pedestrian crossing opportunities (nearly a half mile between crossing opportunities)
- Willow Road bike lanes end before Owens Drive (crossing Owens is very difficult because it's a huge intersection)

General Issues/Systemwide Comments

Bike parking issues

- eLockers not full at Rockridge and some other stations, while full at others (Lake Merritt)...perhaps an issue of placement/advertising?
- Need to promote BikeLink/Bike Station...perhaps a video like SFPark program?
- BikeLink needs to be Clipper-compatible systemwide

Station access issues

- Should be two-way bike paths that loop around each station to access any/all bike paths and entry/exit points
- "Bus Only" lanes should allow bikes too
- BART needs to work with the surrounding jurisdictions on streets/access
- BART should actively work with junior colleges for increased bike access
- BART should increase bike access to regional trails
- Urge local jurisdictions that have "Bikes May Use Sidewalk" signs to build those sidewalks to 10 feet wide
- Add curb-cuts to that allow bicyclists to ride all the way bike parking areas

Signage issues

- All stations should have a map/signage of elevator locations
- Need maps/signage at each station on how to access the station via bike. Post them on the platform, bike parking area and other appropriate areas
- There needs to be systemwide, uniform signage to connect BART stations with regional bike paths
- Create a signage program for bike access in areas surrounding BART stations and request that local jurisdictions fund and install those signs.
- Change "BUS ONLY" signs to "BUS ONLY, emergency vehicles and bicycles permitted," and add sharrows as appropriate to bus lanes

Inter-Agency Planning Suggestions for BART

- Request that MTC and ABAG adopt resolutions indicating that getting bicyclists to BART stations is a worthy priority.
- Encourage congestion management agencies (CMAs) to fund BART station bike access projects
- Provide input to any up-dates of bike plans that include BART stations.
- Request local jurisdictions to include in General Plans easy access to BART station access without an automobile

Ideas for Online Survey

- Are "Walk Bike Here" signs being followed?
- Are you familiar/do you understand BikeLink?
- What prompted you to start biking to BART?
- Would you prefer using escalators at BART stations?

San Francisco Bicycle Coalition meeting, 6/8/11

Issues Specific to San Francisco BART Stations

Embarcadero

On-station/parking issues

- Where are the elevators?
- Need a second elevator to reach platform
- Bike station is good for self-service, but needs wayfinding
- No short-term bike parking, just Bike Station

Montgomery

On-station/parking issues

- Where is the elevator? Needs a bike icon.
- Elevator approach is dark and scary and needs lighting and signage
- No bike parking

Powell

On-station/parking issues

- Better to have above-ground storefront Bike Station, not necessary at station

Off-station access issues

- Wayfinding from station to station , on 5th Street, Market Street...see official routes

Civic Center

On-station/parking issues

- Activate storefronts with an on-street Bike Station
- Excellent parking, very well utilized, some theft but not too much

Off-station access issues

- Wayfinding to elevator needed
- Easy to find parking, but coming from west (Mission Street) it's invisible
- 7th/8th/Market/Grove need improved bike routes

16th Street/Mission

On-station/parking issues

- Bike channel, wayfinding to this stairway

Off-station access issues

- Safe Routes To Transit project on 17th Street bike lanes (Hoffman to Mission)

Glen Park

On-station/parking issues

- Opportunity for street level Bike Station? Partner with SF Dept of Environment

Off-station access issues

- Recent street improvements on Bosworth Street and San Jose Avenue provide good access

Balboa Park

On-station/parking issues

- Bike Station opportunity at station---long term?

Off-station access issues

- Recent path ribbon-cutting
- MTA has money for a crosswalk across Ocean Avenue
- Need better access and wayfinding from Ocean Avenue

General Issues/Systemwide Comments

Station/bike parking issues

- Lockers not appropriate in dense San Francisco
- Berkeley above ground Bike Station is a good model
- sfbike.org/bike has a pdf of a study on escalator access for bikes (Rotterdam transportation tunnel example)
- Platform access from station
- Stairs are ok for some
- Elevators smell like urine

Station access issues

- Wayfinding needs a systemwide protocol to identify where parking is, where nearby destinations are, and where stations are (pilot wayfinding project from 8 years ago?)

Other issues

- Station agents don't know bike policies (e.g. folding bikes)
- Increased blackout hours not good because shadow gets bigger and less room for flexibility
- Liberating blackout period...dedicated car or half of a car (NYC 24/7 governed by courtesy)

San Mateo County

As a virtual organization, San Mateo County's bicycle advocacy group, Bike San Mateo County, did not physically meet as did the organizations in the other BART counties. However, the same materials – an explanation of the process and aerial photographs of each station – were posted on the group's website and comments were solicited. Although no specific comments regarding the six stations in San Mateo County were received, it is expected that members of Bike San Mateo County will have comments on the Draft BART Bicycle Plan.

Countywide bicycle advisory committee comments

Contra Costa Transportation Authority Bicycle/Pedestrian Advisory Committee meeting, 7/25/11

Issues Specific to Contra Costa County BART Stations

Pittsburg/Bay Point

Off-station access issues

- Make BART Bike Plan consistent with Station Area Specific Plan for high-density development
- Coordinate with Bailey Road Pedestrian and Bicycle Improvement Plan
- Improve Bailey Road crossing and station access from Delta De Anza Trail

North Concord

Off-station access issues

- Connection needed from station to Port Chicago Hwy---existing trail is unfinished, needs better access from North Concord to station
- Delta Diablo Trail to BART needs connection
- Naval Weapons Station eventually housing and trail opportunities

Concord

Off-station access issues

- Bike route from east parking lot to Contra Costa Canal trail via Mt. Diablo St. and Maria Avenue
- Bank of America property just purchased (Oak/Galindo)---bike connections could be made to improve local access

Pleasant Hill

Off-station access issues

- Construct shortcut path to Pleasant Hill BART to reduce travel distance by 3/4 mile

Walnut Creek

Off-station access issues

- EBRPD wants connection to Iron Horse Trail
- Development proposal to replace existing office with residential development needs to include trail and have route identification to station
- Barrier to west side of 680 freeway via Ignacio Valley Rd

Lafayette

On-station/parking issues

- Accessing Diablo Trail requires going through BART fare gates
- No lockers on south side of station

Off-station access issues

- Oak Hill Road (from Diablo Trail)---need to cross freeway off-ramp and eastern parking lot, lighting also
- City feasibility study along EBMUD aqueduct
- Oak Hill and Deer Hill off-ramps - issues with Caltrans

Orinda

Off-station access issues

- City wants to connect Moraga Way with Orinda Way to help decrease congestion on Camino Pablo overcrossing
- Wilder project, city trail master plan---south from station on Caltrans' right-of-way on easy side of freeway
- Connect BART station and St Stephen's Trail along Highway 24 and on Bryant Way

El Cerrito Del Norte

Off-station access issues

- Specific Plan around station area? Yvette?

General Issues/Systemwide Comments

- Use 1976/78 "BART and Trails" for historic context
- Include findings from BART-sponsored access studies at Walnut Creek, Pleasanton, San Leandro, Union City stations
- Look at parking lot improvements and how they relate to bikes

Alameda County Transportation Commission, Bicycle/Pedestrian Advisory Committee meeting, 7/26/11

Issues Specific to Alameda County BART Stations

El Cerrito Plaza Station

On-station/parking issues

- El Cerrito Plaza bike link lockers need maintenance

Macarthur Station

Off-station access issues

- Bike lanes on 40th Street

Hayward Station

On-station/parking issues

- Escalators needed on west side of station

San Leandro Station

On-station/parking issues

- San Leandro needs more ramps
- Escalator needed

Off-station access issues

- Sidewalks are not wide enough to accommodate pedestrians and bikes

Fruitvale Station

On-station/parking issues

- Fruitvale and Berkeley bike stations limited to commute hours, especially no option at Fruitvale

Off-station access issues

- Bike access was never identified when parking structure went in. Need safe bicycle network connection from Alameda/Fruitvale Avenues around parking garage

Dublin/Pleasanton Station

Off-station access issues

- Iron Horse Trail goes right through station
- Dublin/Pleasanton: Trail to Hacienda

Fremont Station

On-station/parking issues

- No ADA-accessible fare gates

Off-station access issues

- Four access routes to Fremont station...shared with pedestrians or motor vehicles

Rockridge Station

On-station/parking issues

- No ADA-accessible fare gates

Bay Fair Station

On-station/parking issues

- Bay Fair parking lot scary for cyclists on BART property. Directional signs and sharrows needed

Ashby Station

Off-station access issues

- No direct bike access

General Issues/Systemwide Comments

- Each BART station has obstacles for bikes
- Increase the number of senior citizens riding to BART by bike
- BART refuses anyone to ride through stations with walk bike signs...can be a far walk...plenty of room for cyclists and bike access.
- Payment needed for valet, but self-parking pay required=incongruous
- Vertical racks on last car
- Need to ID where 1st car will be or change to middle car

San Francisco Bicycle Advisory Committee, Meeting 7/28/11

Issues Specific to San Francisco County BART Stations

Balboa Park

Off-station access issues

- The pedestrian/bike bridge over Ocean Avenue should be redesigned to cross Geneva Avenue also, when the time arrives to rebuild it. This will provide better access from City College.
- Convert service road under BART tracks between Balboa Park and Daly City into a bike path

General Issues/Systemwide Comments

- Signs around stations should promote helmet use

City/County Association of Governments of San Mateo County, Bicycle Pedestrian Advisory Committee, Meeting 7/28/11

Issues Specific to San Mateo BART Stations

South San Francisco

On-station/parking issues

- Need additional bike lockers

Colma

Off-station access issues

- Maintain the path that meets Alberti Teglia and install new crossing to it, between the corner of Reiner and A Streets

General Issues/Systemwide Comments

- Need wayfinding signs on local streets to the stations and to the bike parking at stations.
- Promote greater use of foldable bikes.
- Install bike-sharing pods at stations; offer the ability to pay using BART passes or Clipper cards.
- Address current on-board access issues in the existing conditions chapter.
- Conduct public outreach to major employers near BART stations.

E.1 History of Station Improvements

Home origin stations	Bicyclists per avg 1998 weekday	Bicycle % (1998)	Bicyclists per avg 2008 weekday	Bicycle % (2008)	% point change	% change	Improvements	Improvement classification	Community
12th St. / Oakland City Center	44	1.1%	73	2.6%	1.5%	128%	No BART bike parking (City of Oakland facilities at street level)	None	East Bay Mid
16th St. Mission	164	3.4%	263	5.4%	2.1%	62%	77 paid area wave racks and signage (2000). Stair channel (2007)	Medium	SF
19th St. / Oakland	52	2.5%	154	6.2%	3.7%	152%	64 rack spaces on concourse level, double-deckers from Berkeley (2010-after 2008 survey)	Medium	East Bay Mid
24th St. Mission	111	1.4%	420	4.8%	3.4%	237%	70 paid area racks (2005)	Medium	SF
Ashby	204	7.4%	385	11.7%	4.4%	59%	93 rack spaces added (2001/02). 12 retrofitted electronic lockers plus 24 are keyed metal lockers (2007/2008).	Medium	East Bay North
Balboa Park	53	0.7%	183	1.9%	1.2%	168%	30 rack spaces added (2001/02). 65 paid area racks (2006)	Medium	SF
Bay Fair	64	1.9%	98	2.2%	0.3%	14%	42 rack spaces added (2001/02). 16 keyed metal lockers--from San Leandro (2007/2008)	Medium	East Bay South
Castro Valley	16	1.0%	40	1.9%	0.9%	96%	None	Low	East Bay East
Civic Center / UN Plaza	157	4.5%	198	4.5%	0.0%	0%	63 paid area racks (2005)	Medium	SF
Coliseum / Oakland Airport	57	2.2%	13	0.5%	-1.7%	-78%	63 rack spaces added (2001/02).	Medium	East Bay South
Colma	N/A	N/A	22	0.7%	0.7%		24 rack spaces at opening, 24 keyed lockers (June 2003)	Low	Daly City South
Concord	60	1.5%	129	3.0%	1.5%	104%	119 rack spaces added (2001/02). 16 Bicycle Parking Network--phone	High	East Bay East

Home origin stations	Bicyclists per avg 1998 weekday	Bicycle % (1998)	Bicyclists per avg 2008 weekday	Bicycle % (2008)	% point change	% change	Improvements	Improvement classification	Community
							reservation (2005)		
Daly City	0	0.0%	34	0.6%	0.6%		32 rack spaces added (2001/02). 20 locker spaces added (2001/02). 4 retrofitted electronic lockers (2007/2008)	Medium	Daly City South
Downtown Berkeley	180	5.8%	278	9.8%	4.0%	70%	Installation of bicycle station (1999) and expansion of bicycle station (2010)	High	East Bay North
Dublin / Pleasanton	59	1.9%	78	1.4%	-0.5%	-27%	12 retrofitted electronic lockers--from MacArthur (2007/2008)	Low	East Bay East
El Cerrito del Norte	51	0.8%	192	2.9%	2.1%	253%	154 rack spaces added (2001/02).	High	East Bay North
El Cerrito Plaza	128	3.6%	226	6.4%	2.8%	77%	94 rack spaces added (2001/02). 48 adjacent electronic lockers by City of El Cerrito (2002).	High	East Bay North
Embarcadero	137	7.6%	212	9.0%	1.4%	18%	Bike Station 130 rack spaces (2002)	High	SF
Fremont	63	2.0%	76	1.4%	-0.6%	-32%	121 rack spaces added (2001/02).	High	East Bay South
Fruitvale	224	4.3%	543	9.9%	5.6%	131%	49 rack spaces added (2001/02). Attended Bike Station (2004)	High	East Bay South
Glen Park	88	1.6%	135	2.1%	0.4%	27%	44 rack spaces added (2001/02). Paid area racks (2006)	Medium	SF
Hayward	85	3.2%	37	1.2%	-2.0%	-62%	70 rack spaces added (2001/02).	Medium	East Bay South
Lafayette	36	1.5%	53	2.0%	0.5%	32%	84 rack spaces added (2001/02).	Medium	East Bay East
Lake Merritt	114	5.4%	245	8.2%	2.8%	51%	21 rack spaces added (2001/02). 12 lockers spaces added (2001/02). 32 retrofitted electonic lockers; 20 old plastic lockers removed (2007/2008).	Medium	East Bay South
MacArthur	162	4.4%	361	8.2%	3.8%	87%	84 rack spaces added (2001/02). 40 elockers; old 30 keyed metal lockers and	High	East Bay Mid

Home origin stations	Bicyclists per avg 1998 weekday	Bicycle % (1998)	Bicyclists per avg 2008 weekday	Bicycle % (2008)	% point change	% change	Improvements	Improvement classification	Community
							56 plastic lockers removed (2007/2008).		
Millbrae	0		32	1.1%			40 rack spaces and 40 keyed locker spaces (June 2003)	Medium	Daly City South
Montgomery St.	52	2.1%	24	1.3%	-0.8%	-39%	No bicycle facilities	None	SF
North Berkeley	138	5.4%	249	8.4%	3.0%	55%	Covered wave racks, plastic lockers--58 spaces (1998). 94 rack spaces added (2001/02). 12 retrofitted electronic lockers (from MacArthur) plus 36 elockers added, and 58 plastic lockers removed (2007/2008).	High	East Bay North
North Concord / Martinez	12	0.9%	12	0.6%	-0.4%	-39.00%	30 rack spaces added (2001/02).	Low	East Bay East
Orinda	34	1.7%	43	2.0%	0.3%	18%	26 rack spaces added (2001/02). 8 keyed lockers spaces added (2001/2002).	Low	East Bay East
Pittsburg / Bay Point	46	1.3%	24	0.5%	-0.8%	-60%	None	Low	East Bay East
Pleasant Hill	119	2.2%	182	3.4%	1.3%	59%	224 rack spaces added (2001/02). 24 e-lockers (2006/07).	High	East Bay East
Powell St.	99	2.5%	78	2.0%	-0.5%	-18%	7 paid area rack spaces (2005)	Low	SF
Richmond	106	2.8%	56	2.1%	-0.7%	-25%	42 rack spaces added (2001/02). 16 electronic lockers (2006/07)	Medium	East Bay North
Rockridge	95	3.1%	166	4.8%	1.7%	54%	126 rack spaces added (2001/02). 32 elockers; 20 plastic lockers removed (2007/2008).	High	East Bay Mid
San Bruno	0		26	1.6%			18 rack spaces and 30 keyed lockers (June 2003)	Medium	Daly City South
San Leandro	48	1.5%	104	2.6%	1.1%	75%	84 rack spaces added (2001/02). Swap	Medium	East Bay South

Home origin stations	Bicyclists per avg 1998 weekday	Bicycle % (1998)	Bicyclists per avg 2008 weekday	Bicycle % (2008)	% point change	% change	Improvements	Improvement classification	Community
							plastic/metal lockers (2001/02). 20 electronic lockers plus 12 keyed metal lockers; 16 keyed metal lockers moved to Bay Fair (2007/2008).		
South Hayward	40	1.9%	43	1.6%	-0.3%	-17%	56 rack spaces added (2001/02).	Medium	East Bay South
South San Francisco	0		12	0.5%			30 rack spaces and 30 keyed lockers (June 2003)	Medium	Daly City South
Union City	51	2.1%	53	1.6%	-0.5%	-25%	69 rack spaces added (2001/02). 20 locker spaces added (2001/02).	Medium	East Bay South
Walnut Creek	73	2.2%	89	2.2%	0.0%	1%	91 rack spaces added (2001/02). 16 locker spaces added (2001/02).	Medium	East Bay East
West Oakland	28	0.9%	198	4.8%	3.9%	419%	84 racks spaces added (2001/02). 6 retrofitted electronic lockers--from MacArthur (2007/2008).	Medium	East Bay Mid

F | Needed Station Area Improvements

This appendix contains a list of station area improvements to facilities outside of BART property expected to encourage bicycle access to BART stations. Since this list is intended to aid local efforts to secure funding for these projects, it is meant to include just those identified in local bicycle plans. Please see Appendix D for other potential improvements, suggested by countywide advocates and BPAC members.

Issues Specific to Alameda County BART Stations

Station	Source	Project description and location	Strategy type
12th St	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on Franklin between 8th and 14th	Class II bike lane
12th St	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on Webster between 8th and 15th	Class II bike lane
12th St	City of Oakland Bicycle Plan (2007)	Construct mixed class bikeway on 14th St, Brush St to Oak St	Class II bike lane / Oakland Class III A
12th St	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on Clay St, San Pablo Ave to 9th St	Class II bike lane
19th St	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on Webster between 8th and 14th	Class II bike lane
19th St	City of Oakland Bicycle Plan (2007)	Construct mixed class bikeway on 20th St, Telegraph Ave to Harrison St	mixed
19th St	City of Oakland Bicycle Plan (2007)	Construct mixed class bikeway on Telegraph Ave from Broadway to 20th St	mixed
19th St	City of Oakland Bicycle Plan (2007)	Construct bike lanes on Harrison St/Lakeside Dr, Grand Ave to Madison St	Class II bike lane
Ashby	Berkeley Bicycle Plan (2005)	Connect station to Milvia Street Bicycle boulevard via intersection improvements at Adeline/Ashby.	Intersection improvement
Ashby	Berkeley Bicycle Plan (2005)	Improvements to Woolsey Class III Bicycle Route on both east and west sides of station, potentially including traffic calming, signs and markings.	Class III bike route
Ashby	Berkeley Bicycle Plan (2005)	Connection to King Bicycle boulevard via improved bike crossing at Woolsey/MLK (signs, markings, flashing warning lights or a "HAWK" signal).	Intersection Improvement
Ashby	Berkeley Bicycle Plan (2005)	Connection to Woolsey Class III Bicycle Route via an improved bike crossing of Adeline (signs, markings, flashing warning lights or a "HAWK" signal).	Intersection Improvement
Ashby	City of Oakland Bicycle Plan (2007)	Shattuck Ave bike lanes, Berkeley border to 45th St	Class II bike lane
Bay Fair	Bay Fair BART TOD & Access Plan (2007)	Construct Class II bike lanes on access roads within Bayfair Center complex	Class II bike lane
Bay Fair	Bay Fair BART TOD & Access Plan (2007)	Redesign intersection of Coelho Drive and Mooney Avenue to simplify negotiation for all modes	Intersection improvement
Bay Fair	Bay Fair BART TOD & Access Plan (2007)	Construct Class II bike lanes along Estudillo Canal between BART station and Bayfair Center	Class II bike lane

Bay Fair	Bay Fair BART TOD & Access Plan (2007)	Widen underpass or construct separate bicycle tunnel along Thornally Drive under the BART tracks to accommodate bicycles	Network gap
Bay Fair	Bay Fair BART TOD & Access Plan (2007)	Construct Class II bike lanes on Fairmont Avenue east of Hesperian Boulevard	Class II bike lane
Bay Fair	Bay Fair BART TOD & Access Plan (2007)	Construct Class I path on BART right of way (this is not the East Bay Greenway, which veers away from the BART property at that station)	Class I path
Bay Fair	Bay Fair BART TOD & Access Plan (2007)	Construct Class II bike lanes on Thornally Drive and Coehlo Drive, west of Hesperian Boulevard	Class II bike lane
Coliseum/Oakland Airport	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on Hegenberger & bike boulevard on 75th Ave (for southbound access vs Hegenberger), Snell, and Hamilton	Class II bike lane
Coliseum/Oakland Airport	City of Oakland Bicycle Plan (2007)	Construct mixed class bikeway between San Leandro St and Mills College on 69th Ave (San Leandro St to International Blvd); Havenscourt Blvd (International Blvd to Bancroft Ave); Camden St (Bancroft Ave to MacArthur Blvd)	mixed
Coliseum/Oakland Airport	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on San Leandro St (69th to 75th Aves)	Class II bike lane
Coliseum/Oakland Airport	City of Oakland Bicycle Plan (2007)	Class I path along rail ROW (e.g. East Bay Greenway	Class I
Coliseum/Oakland Airport	City of Oakland Bicycle Plan (2007)	Construct Class I multi-use trail along Slough to Bay Trail (BART to Bay Trail connector)	Class I
Downtown Berkeley	Berkeley SOSIP (2010)	Establish continuous Class II bike lanes or additional traffic calming/diversion (including reconfiguring University/Milvia intersection) along Milvia Bicycle boulevard between University Avenue and Allston Way	Class II bike lane or Bicycle boulevard
Downtown Berkeley	Berkeley SOSIP (2010)	Extend Class II bike lanes on Hearst Avenue from west of Shattuck Avenue to the UC campus	Class II bike lane
Downtown Berkeley	Berkeley SOSIP (2010)	Establish a northbound contraflow bicycle lane on Fulton Street between Dwight Way and Durant Avenue	Class II bike lane
Downtown Berkeley	Berkeley Bicycle Plan (2005)	Improve Center Street "Class 2.5" Bikeway from Shattuck to Oxford, including traffic calming, signs and markings.	Class III sharrow
Downtown Berkeley	Berkeley SOSIP (2010)	Reconfigure Shattuck Avenue to become a "complete street" by adding bicycle lanes south of Center Street (separate or protected lanes where feasible)	Class I pathway (directional) and/or Class II bike lane
Downtown Berkeley	Berkeley Bicycle Plan (2012, proposed)	Establish new Bicycle boulevard on Addison Street west of Milvia to provide connection to Downtown Berkeley BART from the west.	Class III Bicycle boulevard

Dublin/ Pleasanton	Dublin Bikeways Master Plan (2007)	Construct Trail along edge of future TOD projects, trail just west of 4480 Hacienda Drive and south of 4460 Hacienda Drive	Class I path
Dublin/ Pleasanton	Dublin Bikeways Master Plan (2007)	Continue bike lanes to intersections and install bike detection at intersections within .5 miles of station	Intersection improvement
Dublin/ Pleasanton	Dublin Bikeways Master Plan (2007)	Iron Horse Trail Improvements within BART station area	Class I path
Fremont	City of Fremont Bicycle Plan (2012)	Complete Class II bike lanes on Civic Center Drive near station	Class II bike lane
Fremont	City of Fremont Bicycle Plan (2012)	Construct Class I multi-use trail along UPRR ROW	Class I path
Fruitvale	City of Oakland Bicycle Plan (2007)	Construct East Bay Greenway (Class I multi-use trail)	Class I path
Fruitvale	City of Oakland Bicycle Plan (2007)	Construct bike lanes on Fruitvale Ave, north of E 12th St	Class II bike lane
Fruitvale	City of Oakland Bicycle Plan (2007)	Construct bike lanes on southbound Fruitvale Ave, E 12th St to E 10th St	Class II bike lane
Fruitvale	City of Oakland Bicycle Plan (2007)	Construct mixed class bikeway on E 12th St	Class II bike lane / Class III bike route
Hayward	City of Hayward Bicycle Plan (2007)	Construct East Bay Greenway (Class I multi-use trail)	Class I path
Hayward	City of Hayward Bicycle Plan (2007)	Construct Class II bike lanes on B and C streets (west of BART station)	Class II bike lane
Hayward	City of Hayward Bicycle Plan (2007)	Construct Class III routes on Montgomery to the north of station and C street to the east of station	Class III bike route
Lake Merritt	Lake Merritt Station Area Plan Draft (2011)	Construct Class II bike lanes on Madison/Oak Streets (couplet)	Class II bike lane
Lake Merritt	Lake Merritt Station Area Plan Draft (2011)	Construct Class II bike lanes on 8th and 9th Streets (couplet, Harrison St to Oak St)	Class II bike lane
Lake Merritt	Lake Merritt Station Area Plan Draft (2011)	Construct Class II bike lanes on Franklin/Webster Streets (8th/9th Sts, couplet)	Class II bike lane
Lake Merritt	Lake Merritt Station Area Plan Draft (2011)	Construct Class II bike lane on 10th Street east of Madison Street	Class II bike lane
Lake Merritt	Lake Merritt Station Area Plan Draft (2011)	Construct Class III route on 14th Street	Class III bike route
MacArthur	MacArthur BART AFS (2008)	Construct Class II bike lanes on West MacArthur Boulevard between Market Street and Telegraph Ave	Class II bike lane
MacArthur	MacArthur BART AFS (2008)	Construct Class II bike lanes on West MacArthur Boulevard between Telegraph Ave and Broadway	Class II bike lane

MacArthur	MacArthur BART AFS (2008)	Construct Class II bike lanes along Telegraph Avenue between 20th Street and Highway 24	Class II bike lane
MacArthur	MacArthur BART AFS (2008)	Construct Class II bike lanes along 40th Street from Adeline St to MLK and Telegraph Ave to Webster St	Class II bike lane
MacArthur	MacArthur BART AFS (2008)	Bicycle boulevard on 41st Street from Webster St to Broadway, and on Webster St from 41st to 40th Street	Oakland Class IIIA / Class II bike lane
MacArthur	MacArthur BART AFS (2008)	Signalize West MacArthur Boulevard/Frontage Road/37th Street intersection (bicycle detection included) to connect BART station and West MacArthur Boulevard. Remove a portion of the West MacArthur Boulevard median to allow all movements to and from both Frontage Road and 37th Street.	Intersection improvement
North Berkeley	Berkeley Bicycle Plan (2005)	Install bicycle crossing signal or flashing beacons (HAWK or RRFB) along with improved signs and markings at Virginia Bicycle boulevard crossing of Sacramento.	Intersection improvement
North Berkeley	Berkeley Bicycle Plan (2005)	Improve the Ohlone Greenway crossing of Sacramento at Delaware (potentially including signs and markings, and signal timing).	Intersection improvement
North Berkeley	Berkeley Bicycle Plan (2005)	Improve the on-street bikeway on Delaware around the station using signs and markings.	Class II bike lane
North Berkeley	Berkeley Bicycle Plan (2005)	Improve the Class III Bike Route on Acton on the approach from the north and south and alongside the station, using signage, markings and traffic calming improvements.	Class III bike route
North Berkeley	Berkeley Bicycle Plan (2005)	Traffic calming improvements on the Virginia Bicycle boulevard east and west of the station.	Bicycle boulevard
North Berkeley	Berkeley Bicycle Plan (2005)	Widen and improve the Ohlone Greenway to the north of the station.	Class I Pathway
Rockridge	City of Oakland Bike Plan (2007)	Construct Class 3A Arterial Bike Route on College Ave between Alcatraz Ave and Broadway (was Shafter Ave and Keith Ave)	Oakland Class III A
Rockridge	City of Oakland Bike Plan (2007)	Construct Class 3B Bike Boulevards on Miles Ave between Forest St and College Ave, and on Shafter Ave between Forest St and College Ave .	Bicycle boulevard
Rockridge	City of Oakland Bike Plan (2007)	Construct Class 3B Bike Boulevard on Lawton Ave, Broadway to College Ave	Bicycle boulevard
Rockridge	City of Oakland Bike Plan (2007)	Construct Class 3B Bike Boulevard on Chabot Rd, College Ave to Golden Gate	Bicycle boulevard
Rockridge	City of Oakland Bike Plan (2007)	Construct Class 3B Bike Boulevard on the Shafter/Forest/Colby corridor	Bicycle boulevard

San Leandro	Downtown San Leandro TOD Strategy (2007)	Construct Class III routes on Oakes Boulevard, Chumalia Street and Harrison Street; West Estudillo Avenue west of San Leandro Boulevard; West Joaquin Avenue between San Leandro Boulevard and Hays Street; Santa Rosa Street between Estudillo Avenue and Dolores Avenue; Castro Street between East 14th and Alvaredo Streets	Class III bike route
San Leandro	Downtown San Leandro TOD Strategy (2007)	Construct Class I routes along the East Bay Greenway corridor along the BART right-of-way and in the creekside linear park between East 14th Street and the UPRR line	Class I path
San Leandro	Downtown San Leandro TOD Strategy (2007)	Construct Class II bike lanes on Williams Street between San Leandro Boulevard and Hays Street, on Parrott Street between San Leandro Boulevard and Washington Avenue, and on Hays Street between Davis Street and West Juana Avenue if reconfigured to one-way travel	Class II bike lane
South Hayward	South Hayward BART Access Study (2011)	Construct Class I path along Union Pacific Railroad tracks (UP Regional Trail)	Class I path
South Hayward	South Hayward BART Access Study (2011)	Link the Nuestro Parquecito bikeway to the BART station by providing a Class I path along BART right-of-way (East Bay Greenway)	Class I path
South Hayward	South Hayward BART Access Study (2011)	Construct pedestrian/bicycle bridge linking East Bay Greenway to A Street	Network gap
Union City	Union City Pedestrian and Bicycle Plan (proposed 2012)	Complete bike/ped connection/promenade (to the east of station)	Class I path
West Dublin/ Pleasanton	City of Dublin Bicycle Plan (2007)	Construct Class II bike lanes on Dublin Blvd, St Patrick Way, and Golden Gate Drive	Class II bike lane
West Oakland	City of Oakland Bike Plan (2007)	Construct Class II bike lanes on Peralta Street	Class II bike lane
West Oakland	City of Oakland Bike Plan (2007)	Construct Class II bike lanes on 7th Street from Wood St to MLK Jr Way (mixed Class lanes have been installed from Peralta St to Union St as of Feb 2012)	Class II bike lane

Issues Specific to Contra Costa County BART Stations

Station	Source	Project description and location	Strategy type
Concord	Concord Trails Master Plan (2012)	Improve connections to downtown Concord: establish a Class III bike route from the west BART parking lot to downtown Concord via Grant Street and Salvio Street.	Class III route
El Cerrito del Norte	WCCTAC Transit Enhancement Study (2011)	Install new mid-block crossing to connect Richmond and Ohlone Greenway at San Pablo Avenue	Intersection improvement
El Cerrito del Norte	WCCTAC Transit Enhancement Study (2011)	Enhance the Elm St/Hill St/Key Blvd intersection by adding bike box for NB bicyclists on Elm Street (good for left turn onto Key Blvd)	Intersection improvement
El Cerrito Plaza	WCCTAC Transit Enhancement Study (2011)	Provide a direct Class I connection to NB Bay Trail along hillside between I-580/Central Avenue Overpass and Rydin Road	Class I path
El Cerrito Plaza	WCCTAC Transit Enhancement Study (2011)	Construct Class I path from Central Avenue to Santa Clara Street via Central Park. Also provide pathway connection through Central Park	Class I path
El Cerrito Plaza	WCCTAC Transit Enhancement Study (2011)	Construct Class III bike route on San Luis Street/San Diego Street/Santa Clara Street/Lassen Street between Central Avenue and Lassen Street, and between Ohlone Greenway and San Luis St	Class III route
Lafayette	Lafayette staff, Lafayette City Bikeways Master Plan	Implement the proposed path along the EBMUD Aqueduct ROW near the BART Station (Phase 1 - link to BART station from west side; also bridge over Happy Valley Road and ramp into station's plaza level on south side).	Class 1 path
Lafayette	Lafayette staff, Lafayette City Bikeways Master Plan	Implement Bicycle Boulevard improvements along Lafayette Circle (East and West), Hough Ave and the Downtown Bypass Route streets.	Bicycle Boulevard
Pittsburg/Bay Point	Bailey Road Ped Bike Plan (2010)	Fill in gaps in the Class II lane on Bailey Road between Willow Pass Road and the BART Access Road	Class II lane
Pittsburg/Bay Point	Bailey Road Ped Bike Plan (2010)	At Bailey Road/SR 4, remove the north-side loop off-ramp entirely and improve the west side surface	Intersection improvement

Station	Source	Project description and location	Strategy type
		sidewalk and bicycle lanes	
Pittsburg/Bay Point	Bailey Road Ped Bike Plan (2010)	At Bailey Road/SR 4, improve the westbound (directional) off-ramp at the east side of Bailey Road to accommodate both northbound and southbound traffic turning onto Bailey Road	Intersection improvement
Pittsburg/Bay Point	Bailey Road Ped Bike Plan (2010)	At Bailey Road/SR 4, change the south-side loop off-ramp to a fully signal-controlled T-intersection at Bailey Road. This will eliminate the separated right turn lane from eastbound State Route 4 to northbound Bailey Road.	Intersection improvement
Richmond	WCCTAC Transit Enhancement Study (2011)	Implement streetscape improvements on 23rd Street between Emeric Avenue and Bissell Avenue that include a road diet, sidewalk & crossing enhancements, and a Class III route	Class III route
Richmond	WCCTAC Transit Enhancement Study (2011)	Construct Class I path along the BART track alignment on the west side of Portola Avenue, connecting to future Roosevelt Avenue bike boulevard and 13th Street Class II lanes	Class I path
Richmond	WCCTAC Transit Enhancement Study (2011)	Construct Class III bike boulevard on Roosevelt Avenue between Wilson Avenue and 15th Street, including signage, sharrows, and traffic circles	Bike boulevard
Richmond	WCCTAC Transit Enhancement Study (2011)	Construct Class III bike boulevard on 19th Street between Pennsylvania Avenue and Nevin Avenue, including signage, sharrows, and traffic circles	Bike boulevard
Richmond	WCCTAC Transit Enhancement Study (2011)	Construct Class III bike boulevard on Marina Way between MacDonald Avenue and Ohio Avenue, including signage, sharrows, and potential traffic calming treatments	Bike boulevard
Richmond	WCCTAC Transit Enhancement Study (2011)	Construct Class III bike route on 15th Street between MacDonald Avenue and Richmond Greenway	Class III route

Issues Specific to San Francisco BART Stations

Station	Source	Project description and location	Strategy type
Balboa Park	Balboa Park Station Area Plan (2008)	Construct Class II lanes on Ocean Avenue east to San Jose Ave	Class II lane
Balboa Park	Balboa Park Station Area Plan (2008)	Construct Class II lanes on Phelan Avenue north to Judson Ave	Class II lane
Balboa Park	Balboa Park Station Area Plan (2008)	Provide bicycle improvements along Holloway Avenue	Class III route
Glen Park	Glen Park Community Plan (2011)	Construct Class II lanes on Lyell Street	Class II lane
Glen Park	Glen Park Community Plan (2011)	Construct Class II lanes on Bosworth Street between Diamond and Rotteck Streets	Class II lane
Glen Park	Glen Park Community Plan (2011)	Construct Class II lanes on Monterey Boulevard on- and off- ramps from San Jose Avenue	Class II lane

Issues Specific to San Mateo County BART Stations

Station	Source	Project description and location	Strategy type
Colma	Colma Station Area Plan - 1994	Construct Class II lanes on designated priority north-south and east-west bicycle corridors leading to the Colma BART Station and the Holy Angels Church, including: El Camino Real, San Pedro Road, and A Street.	
Millbrae	Millbrae Bicycle and Pedestrian Transportation Plan August 2009	Millbrae Avenue Pedestrian Overcrossing at US101	Alternative Transportation Mode
Millbrae	Millbrae Station Area Specific Plan 1998	Millbrae and Rollins Intersection Improvement and Expansion	Capacity Expansion to Improve LOS at Millbrae Rollins Intersection
Millbrae	N/A	California Drive and Linden Intersection Safety Improvement	Improve pedestrian safety to and from west side of Millbrae BART Station
South San Francisco	SSF Bicycle Plan (2011)	Install sharrows adjacent to and leading to the BART station on the following roadways: Mission Road (Lawndale to Oak Ave), McLellan (El Camino to Mission Rd), Holly (Mission to Hillside), Miller (Evergreen to Holly)	Class III
South San Francisco	SSF Bicycle Plan (2011)	Improve bicycle access through intersections by adding bicycle detection for bikes at the following locations: McLellan/Lawndale and Mission Road, BART and McLellan, BART and El Camino, El Camino and McLellan, and El Camino and Costco.	Intersection improvement
South San Francisco	El Camino Real/Chestnut Ave Area Plan, Grand Boulevard Initiative's Complete Streets	Implement traffic calming designs to create a safer Class III lane environment	Network gap

G | Investment Tool User's Guide

The memorandum beginning on the following page describes the "user's guide" for the BART Bicycle Investment Tool.

FEHR PEERS

MEMORANDUM

Date: February 23, 2012

To: Steve Beroldo, BART

From: Mackenzie Watten and Brooke DuBose, Fehr & Peers

Subject: ***BART Bicycle Plan Update – BART Bicycle Investment Tool User's Guide***
SF11-0545

This memorandum is a user's guide for the BART Bicycle Investment Tool[1]. The BART Bicycle Investment Tool is a Microsoft Excel based tool that uses the data results from the BART Bicycle Direct Ridership Model (DRM). The purpose of the Investment Tool is to help users identify the most cost-effective bicycle investments in terms of their ability to encourage bicycling as a mode of travel to and/or from BART. The BART Bicycle DRM was developed as part of the BART Bicycle Access Plan Update in 2011-2012. The *BART Bicycle Plan Update – BART Bicycle Direct Ridership Model Development* memorandum, dated February 23, 2012, details the development of the bicycle direct ridership model. The BART Bicycle DRM was based on empirical relationships found through statistical analysis of BART system ridership data, the 2008 BART Passenger Profile Survey, and the 2011 online BART Bicycle Access Survey. Professional judgment was applied to the statistically valid relationships to enable a likely range of relationships for different station types.

The BART Bicycle Investment Tool allows transit agencies to evaluate the costs and benefits of bicycle access improvements at different rail station types[2]. These benefits include the potential mode shift that different bicycle investments generate. The BART Bicycle DRM is the backbone of the Bicycle Investment Tool, and was developed using BART specific data. However, this tool was developed with the goal of being transferable to other rail transit operators. The tool works on a station type level (as defined in Table 1), allowing other transit agencies to use the station type that most closely represents their stations.

[1] This memorandum is accompanied by the *BART Bicycle Direct Ridership Model Development* memorandum, dated February 23, 2012. The BART Bicycle Investment Tool is a Microsoft Excel based tool that uses the BART Bicycle Direct Ridership Model results to identify the most cost-effective bicycle investments in terms of their ability to encourage the use of bicycles as a mode of travel to and/or from BART.

[2] The BART Bicycle Investment Tool was developed using BART data. Non-BART transit agencies should consider calibrating and validating the tool to match their own conditions. There are locations in the tool where the user is asked to input local data if possible. The tool also uses data results from the BART Bicycle DRM. Calibration and validation of a bicycle DRM has high data requirements. Please review the accompanying *BART Bicycle Direct Ridership Model Development* for more information.

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BACKGROUND

Goal of BART Bicycle Access Plan Update

The overall goal of the BART Bicycle Plan Update is to increase the use of bicycles to access BART by developing strategies which make it easier, safer, and more convenient to ride bikes to and from stations and to park bikes at stations. One of the objectives to help realize this goal is to provide a predictive tool for BART to evaluate how bicycle investments affect bicycle mode of access based on a transparent methodology.

BART Bicycle Direct Ridership Model

The *BART Bicycle Plan Update – BART Bicycle Direct Ridership Model Development* memorandum, dated February 23, 2012, details the development of the bicycle DRM. Empirical relationships were found through statistical analysis of BART system ridership data, the 2008 BART Passenger Profile Survey, the 2011 online BART Bicycle Access Survey, and station characteristics. This model is able to predict changes in daily bicycle access ridership at individual stations based on bicycle access and parking investments. The model predicts those bicyclists who park their bicycles at the station and ride BART, and those who take their bicycles on the train. Functionally, total bicycle access ridership is first estimated. Then the percentage of that total bicycle access ridership that is park and ride (P&R) bicycle access ridership is estimated. This value allows the user to determine P&R and board with bike (BwB) bicycle access ridership separately and plan accordingly.

The models were derived from BART-specific ridership, passenger profile surveys, and station characteristics. In an effort to make the model transferrable to other jurisdictions and transit agencies, the model may be applied to a series of station typologies rather than BART stations directly. Table 1 presents the station typologies.

TABLE 1 - STATION TYPOLOGIES

Station Typology	Description	Example BART Stations
Urban	High-ridership with high walk, bike and transit access share. No parking provided. Can be found in downtown or neighborhood business district.	12th Street Oakland, Downtown Berkeley, Embarcadero
Urban with Parking	Similar to “Urban,” but with small parking lots that fill up early. Auto mode share is higher than “Urban”	Ashby, Lake Merritt, North Berkeley, Glen Park
Balanced Intermodal	Well-served by transit that serves primarily corridor and local transit. Parking provided, but fills early due to size. Can be found on urban or suburban grid network. Walk access share is moderate.	Fruitvale, MacArthur, Rockridge

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TABLE 1 - STATION TYPOLOGIES		
Station Typology	**Description**	**Example BART Stations**
Intermodal – Auto Reliant	Well-served by regional and local transit. Large amounts of parking provided. Can be found on suburban grid or residential area. Walk access share is lower than average.	Daly City, El Cerrito Del Norte, Walnut Creek
Auto Dependent	Focus on auto-based access. Large station footprint, structured and/or surface parking, and adjacent highway access. Walk and transit access share predominantly below average.	East Dublin/Pleasanton, Lafayette, Pittsburg/Bay Point
Source: *Access BART,* Arup, 2006.		

ASSUMPTIONS AND CONSTRAINTS

The BART Bicycle Investment Tool uses the data results from the BART Bicycle DRM to help users evaluate the most cost-effective bicycle investments. As described in the *BART Bicycle Plan Update – BART Bicycle Direct Ridership Model Development* memorandum, the method to predict bicycle ridership is a simple process. The station area characteristics are combined with linear coefficients to predict bicycle ridership. As a linear model, the BART Bicycle DRM does not indicate that the relationship between the station area characteristics and bicycle ridership would ever cease. In terms of extremes, it means that if a user added 1,000,000 bicycle rack spaces to a station, that user could expect a bicycle ridership increase of an estimated 1,192,000 riders. Constraints are needed ensure that the Tool is useful for planners.

The Tool applies five constraints to the raw output of the BART Bicycle DRM. These constraints ensure that the model and tool results conform to planners' basic common sense. Once common sense has been engaged, the tool helps the planner evaluate the costs and benefits of bicycle investments.

Mode Share Ceiling

Bicycle access mode shares, defined as bicycle access riders divided by total station riders, are prohibited from exceeding set ceilings. These ceilings are based on the existing observed maximum mode share by station typology. A buffer of 3 percentage points was added to each of the highest mode shares by station typology to allow for some growth at the highest mode share stations. Note that, although these mode share levels exceed the systemwide Plan goal of 8% bicycle access, that figure is meant to be a systemwide average, which assumes that some stations will be below that number, while others will exceed it, Table 2 shows the final ceilings.

TABLE 2 – BICYCLE ACCESS MODE SHARE CEILING BY STATION TYPOLOGY

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Station Typology	2008 Max Station	2008 Max Mode Share	Tool Max Mode Share
Urban	16th Street / Mission	5.7%	8.7%
Urban with parking	Ashby	11.3%	14.3%
Balanced Intermodal	Fruitvale	9.8%	12.8%
Intermodal / Auto Reliant	West Oakland	5.4%	8.4%
Auto Dependent	Pleasant Hill	5.2%	8.2%

Stated Preference and Peak Occupancy of Bicycle Parking Facilities

BART surveyed all types of access riders, asking them their preferred type of bicycle parking facility. This stated preference data was used to generate relative rankings of these facilities for each station and station typology. Please note that this is stated preference data which is prone to many biases. BART also collected bicycle parking peak occupancy data at each station. These two pieces of data were paired to predict if a chosen investment in a bicycle parking facility type could be reasonably expected to increase ridership.

The following logic is used to determine whether bicycle access ridership could be expected to increase based on a hypothetical increase in facility type supply:

A. Investment in a facility type with a pre-investment peak occupancy under 80% will NOT increase bicycle access ridership. The pre-investment facility type is under-utilized so adding more parking of the same type will not increase ridership.

B. Investment in a facility type that does not currently exist but is ranked by the survey to be less preferable than an existing facility type that has a pre-investment peak occupancy under 80% will NOT increase bicycle access ridership. Same logic as step A - a better (according to survey) bicycle parking facility is available and has available capacity. Adding capacity via a less preferred facility type should not be expected to increase bicycle access ridership.

C. Investment in a facility type with a pre-investment peak occupancy over 80% WILL increase bicycle access ridership regardless of survey ranking.

D. Investment in a facility type that does not exist in the pre-investment condition but is ranked higher than an existing pre-investment facility type WILL increase bicycle access ridership.

Note that these logic steps may sometimes result in there being NO options for the user to increase bicycle access ridership. This is intentional - bicycle parking facilities are not the limiting factor for all stations. Other factors should be analyzed to increase bicycle access ridership to these stations.

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Example

TABLE 3 - SURVEY AND OCCUPANCY CHECKS		
Facility Type	**Survey Ranking[1]**	**Pre-Investment Peak Occupancy[2]**
Attended bike station	1	Does Not Exist (DNE)
Electronic lockers	2	73%
Racks inside fare gates	3	DNE
Self serve bike station	4	DNE
Keyed lockers	5	DNE
Racks outside fare gates	6	40%

1. These values are pre-populated based on BART survey data when a user selects a BART station or station typology and loads default values. It is recommended that Non-BART transit agency users edit with local data.

2. These values are pre-populated based on BART observed bicycle parking occupancy data when a user selects a BART station or station typology and loads default values. All users are encouraged to edit if better data is available.

A snapshot of this station reveals that there are currently electronic lockers and racks outside the fare gates. Both are under-capacity (our threshold defined at 80%) - leading us to believe that increasing their supply would not increase ridership. Attended bike stations were the only parking type ranked higher than electronic lockers, so we can conclude that only building an attended bike station would increase ridership.

TABLE 4 - SURVEY AND OCCUPANCY CHECKS DETAILED			
Facility Type	**Survey Ranking**	**Pre-Investment Peak Occupancy**	**Change in ridership with supply increase**
Attended bike station	1	DNE	↑
Electronic lockers	2	73%	←
Racks inside fare gates	3	DNE	←
Self serve bike station	4	DNE	←
Keyed lockers	5	DNE	←
Racks outside fare gates	6	40%	←

Table 4 presents the application of the logic checks (A through D as presented above) to the data from Table 3. Table 4 includes a column that indicates based on the logic checks whether a hypothetical increase in supply by facility type would increase ridership. The calculations show

that only investing in attended bike stations would increase bike access ridership at this station. Please note that the "Change in ridership with supply increase" column is dynamic and will change based on the values of Survey Ranking and Pre-Investment Peak Occupancy. These values change with different BART stations and BART Station Typologies.

BART users may edit occupancy data, while non-BART users may edit both survey ranking and occupancy data. It is advised that non-BART users consider conducting a survey the scale of the one BART undertook to achieve similar results. See the Existing Conditions chapter and Appendix A for details.

Bicycle Parking Facility Supply Ceiling

The tool has established a relationship between bicycle parking facilities and ridership increases. What is not known is the limit of this relationship - how many bicycle parking spaces of a particular type can one add and still expect ridership increases? To constrain ridership increases to reasonable values, thresholds were established based on existing observed supply maximums of each facility type and best judgment. These thresholds represent the maximum observed supplies that were used to develop relationships between facility type supply and ridership increases. The relationship between facility type supply and ridership increase can be expected to hold up to the maximum observed supply but it is unknown how the relationship will change once past that maximum. Bicycle facility supply in excess above the thresholds set in Table 5 will not increase bicycle access ridership. Bicycle facility supply up to the thresholds will still increase bicycle access ridership. These thresholds are by both individual facility type and aggregated similar facility types.

TABLE 5 - BICYCLE FACILITY SUPPLY CEILING (UNITS IN BICYCLE PARKING SPACES)

Facility Type	Individual Threshold	Aggregate Threshold
Rack spaces outside fare gates	250	275
Rack spaces inside fare gates	100	
Keyed locker spaces	40	100
Electronic lockers spaces	100	
Self serve bike station spaces	300	400
Attended bike station spaces	300	
Bike Cages	160	

Example

The individual supply ceiling for rack spaces outside the fare gates is 250. If a user inputs 350 rack spaces outside the fare gates, the tool will report increase in bicycle access ridership for 250 spaces, but costs for all 350 spaces.

The aggregate supply ceiling for locker spaces is 100. If the user inputs aggregate supply above the aggregate supply ceiling, the aggregate supply ceiling is distributed between the facilities based on the user input. If a user inputs 90 electronic locker and 30 keyed locker spaces, the tool will redistributed the user input for the purposes of ridership increase. The user inputted 120 total

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spaces, while the aggregate supply ceiling is 100. For the purposes of the ridership increase calculation, the tool will distribute the ceiling (100) to the facility types based on the user input. In this example, 75% of the user input (90/120) was electronic lockers and 25% of the user inputs (30/120) was keyed lockers. Thus the tool will use 75 electronic lockers (75% of 100) and 25 keyed lockers (25% of 100) for input into the model.

Thus if a user inputs 90 electronic locker and 30 keyed locker spaces, the tool will report increase in bicycle access ridership for 75 electronic locker and 25 keyed locker spaces, but costs for 90 electronic locker and 30 keyed locker spaces.

Bicycle Parking Facility Diminishing Returns on Increased Ridership

According to a comprehensive bicycle parking inventory conducted during the development of this plan, stations with the largest supply of a given facility type have lower observed occupancy rates of the over-supplied facility type than stations with more modest supplies of that parking type. As a conservative estimate, this tool incorporates diminishing returns for bicycle parking facilities as they approach their individual supply ceilings (see Table 5 above). As the scenario investments reach the ceiling, the ridership increase for each facility type unit decreases. Table 6 shows the diminishing return relationship by supply range. Please note that these calculations happen for all bicycle parking facility types separately.

TABLE 6 - INCREASED BICYCLE PARKING FACILITIES INCUR DIMINISHING RIDERSHIP RETURNS (FOR FACILITY TYPES SEPARATELY)

Supply range (the difference between existing supply and individual ceiling)	Percentage of full relationship
1st 25%	100%
2nd 25%	75%
3rd 25%	50%
4th 25%	25%

Example

Please note that these calculations happen for all facility types separately. The example below just shows the calculation for rack spaces outside the fare gates.

A station has 50 existing rack spaces outside the fare gates. The user inputs 125 rack spaces outside the fare gates to be installed for its chosen scenario. The difference between the existing supply and the individual ceiling is 200. (Individual ceiling for rack spaces outside fare gates of 250 and 50 existing spaces). The difference between the existing supply and the individual ceiling is then split into supply ranges for diminishing return calculations (Table 7).

TABLE 7 - DIMINISHING RETURNS SETUP FOR RACKS

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OUTSIDE FARE GATES[1]	
Scenario supply range	**Percentage of full relation**
0-50	100%
51-100	75%
101-150	50%
151-200	25%
1. Example shown for racks outside fare gates only. These calculations happen for all facility types.	

The user inputs 125 rack spaces outside the fare gates. The following calculations determine total bicycle access ridership increase including diminishing returns if we assume that the relationship between a bicycle rack space and bicycle access ridership is 1 (for demonstration only).

TABLE 8 - DIMINISHING RETURNS CALCULATIONS FOR RACKS OUTSIDE FARE GATES[1]			
Scenario supply range	**Scenario supply in range**	**Percentage of full relation.**	**Ridership increase**
0-50	50	100%	50.0
51-100	50	75%	37.5
101-150	25	50%	12.5
151-200	0	25%	0.0
Total	125		100.0
1. Example shown for racks outside fare gates only. These calculations happen for all facility types.			

The total bicycle access ridership increase is calculated to be 100 with the effects of diminishing returns. The total bicycle access ridership would have been calculated to be 125 without the effects of diminishing returns.

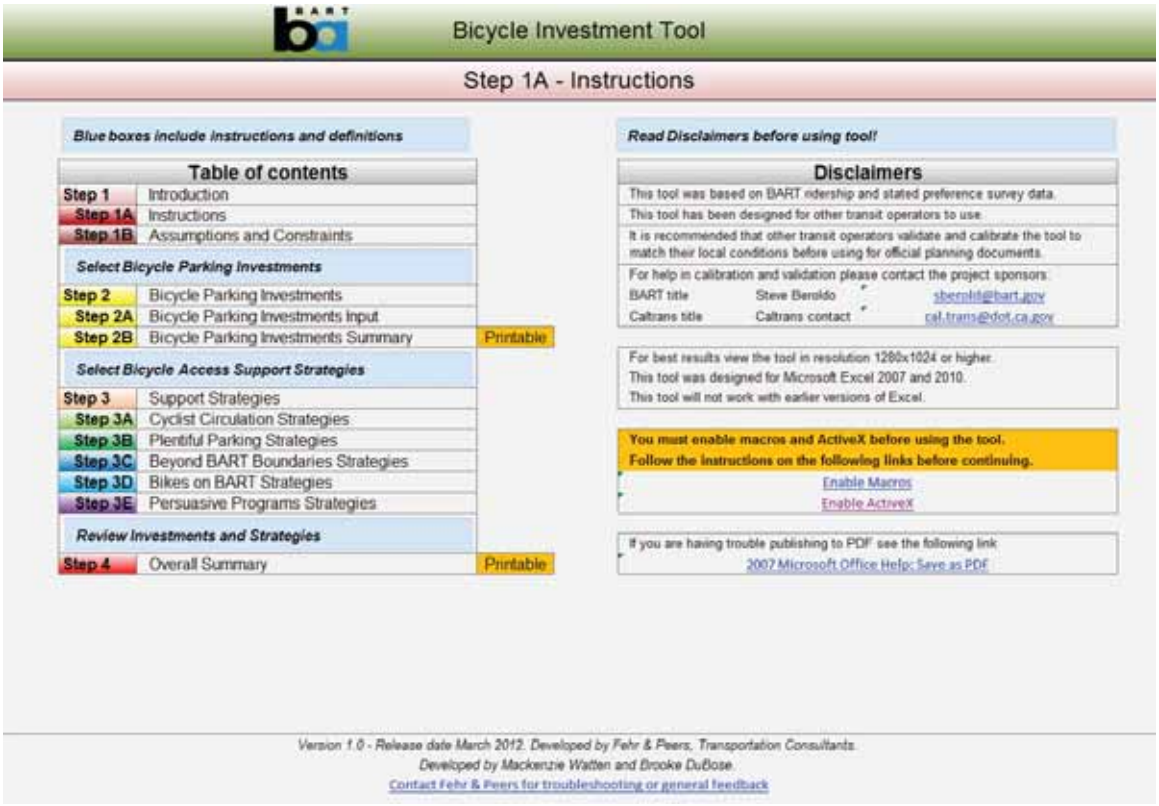
TOOL WALKTHROUGH

This section provides a general overview of the contents of the BART Bicycle Investment Tool. Please refer to the tool for detailed instructions, which are provided in the Tool as blue boxes like the following:

Blue boxes include instructions and definitions

Instructions

The instructions tab contains a table of contents and disclaimers on using the tool.



Assumptions and Constraints

This page mirrors the assumptions and constraints discussion from this document.

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Bicycle Investment Tool

Step 1B - Assumptions and Constraints

1. Bicycle Access Mode Share

1.1 Calculation of Bicycle Access Mode Share

Bicycle access mode share is calculated to be consistent with the BART Bicycle Plan bicycle access mode share goals. The data used to develop the tool did not indicate whether the increase in bicycle access riders would be those who already ride BART and shift modes or those entirely new to the BART system. The decision was made to assume that all new bicycle access riders would be considered new to the BART system. This is a conservative approach in terms of estimating bicycle access ridership but is not conservative in terms of estimating BART revenue. This tool is focused with the former.

Example:

A station has 4,500 total station access riders and 225 bicycle access riders in pre-investment conditions for a bicycle access mode share of 5%.
The tool identifies 50 new bicycle access riders due to bicycle parking investments.
There are now 4,550 total station access riders and 275 bicycle access riders at the station for a bicycle access mode share of 6%.

Tool Implementation:

Mode share is calculated for each scenario as described above and presented on graph 2.3 on the "Bicycle Parking Invest. Summary" tab along with the corresponding number of bicycle access riders and total station riders.

1.2 Bicycle Access Mode Share Ceiling

As a check on the tool, mode shares are prohibited from going above set ceilings. These ceilings were based on existing observed maximum of mode share. A buffer of 3 percentage points was added to each of the highest observed mode share to allow for some growth at the highest mode share stations. Table 1.2 shows the final ceilings.

Tool Implementation:

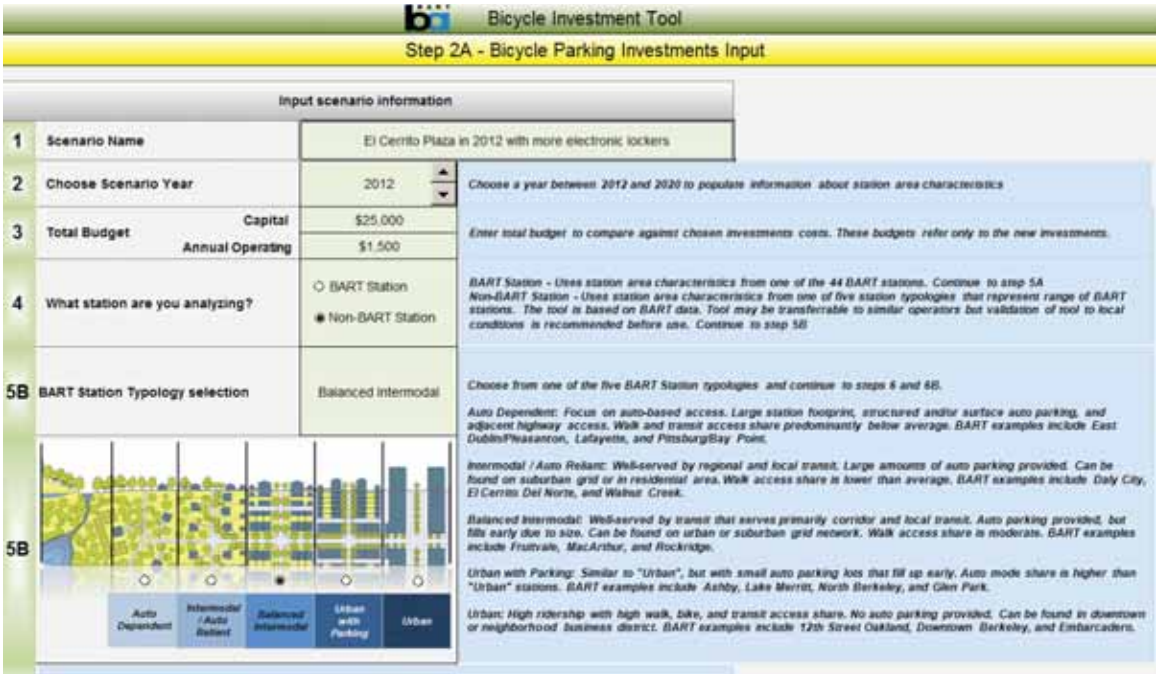
Graph 2.3 on the "Bicycle Parking Invest. Summary" tab graphical represents mode share, including the maximum allowed for your station.

Table 1.2 - Bicycle Access Mode Share Ceiling by Station Typology

Station Typology	2008 Max Station	2008 Max Mode Share	Tool Max Mode Share
Urban	16th Street / Mission	5.7%	8.7%
Urban with parking	Ashby	11.3%	14.3%
Balanced Intermodal	Fruitvale	9.8%	12.8%
Intermodal / Auto Reliant	West Oakland	5.4%	8.4%
Auto Dependent	Pleasant Hill	5.2%	8.2%

Bicycle Parking Invest. Input

Bicycle Parking Investment Input is the location where the user can input their scenario specific investments. Together with the next tab, 'Bicycle Parking Investment Summary,' the user can put together an investment scenario that meets their station's needs.



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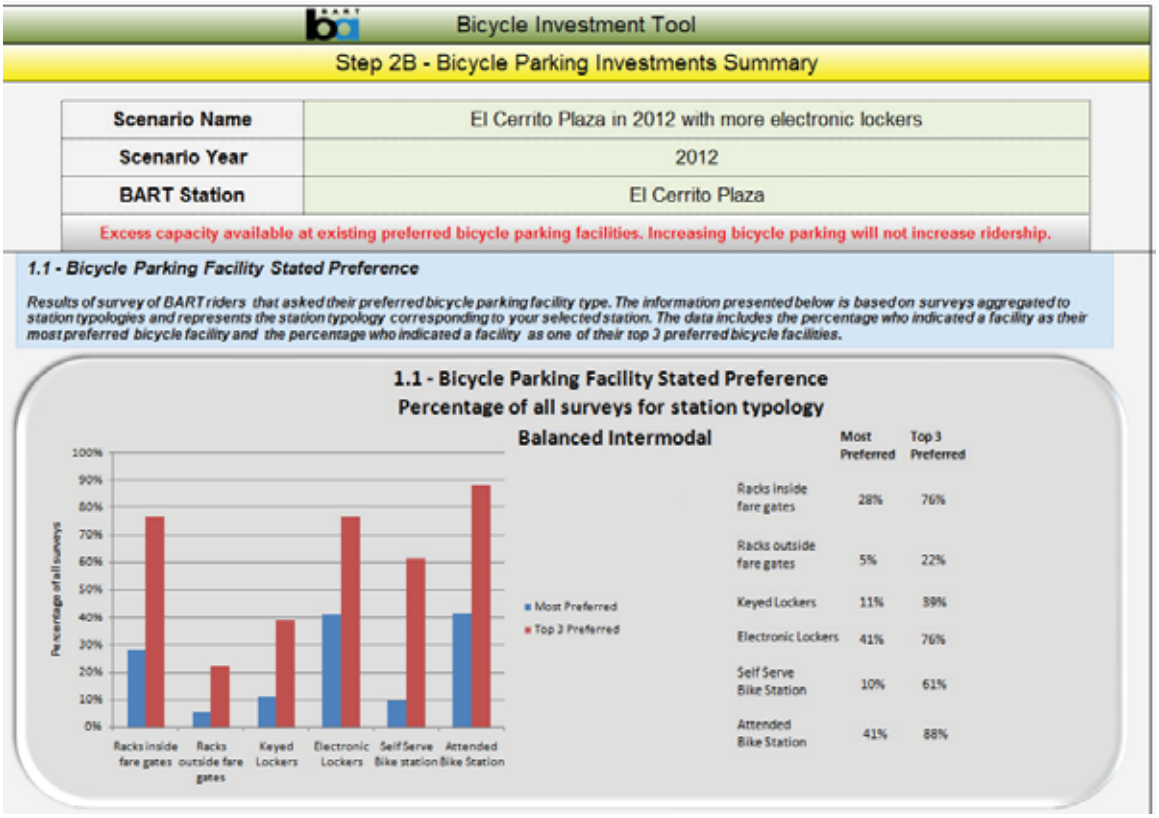
Bicycle Parking Invest. Summary (Printable!)

The Bicycle Parking Investment Summary tab contains information to review before and after the user chooses their investments. The information helps guide the user to investments that will serve the needs of their station.



This page is printable to a printer or PDF. The page is formatted to print in two pages and can be a handy reference guide.

Support Strategies

In addition to bicycle parking facility investments, complementary strategies can be selected to put together a complete planning package. Note that the cost and potential increase in bicycle access ridership associated withthese strategies is unknown. It is the hope that future iterations of this tool will incorporate costs and benefits for these strategies.

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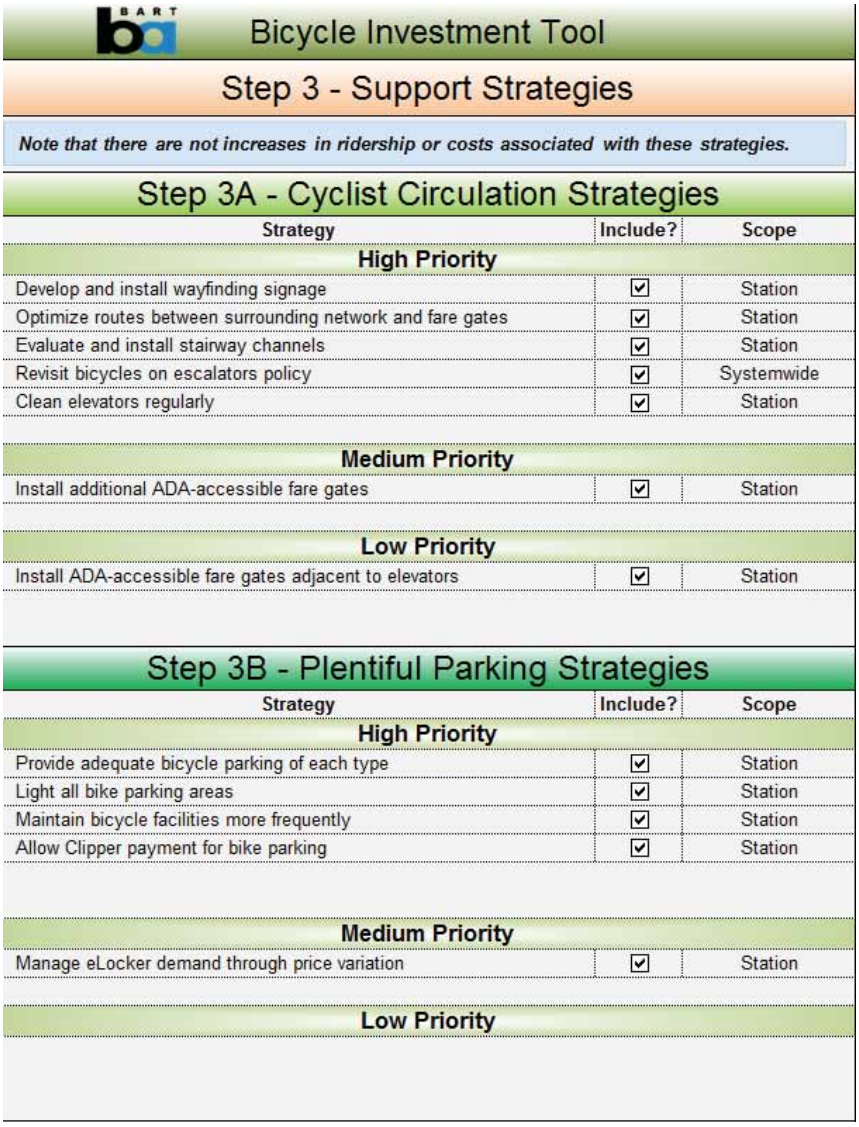


Bicycle Investment Tool

Step 3 - Support Strategies

Note that there are not increases in ridership or costs associated with these strategies.

Step 3A - Cyclist Circulation Strategies

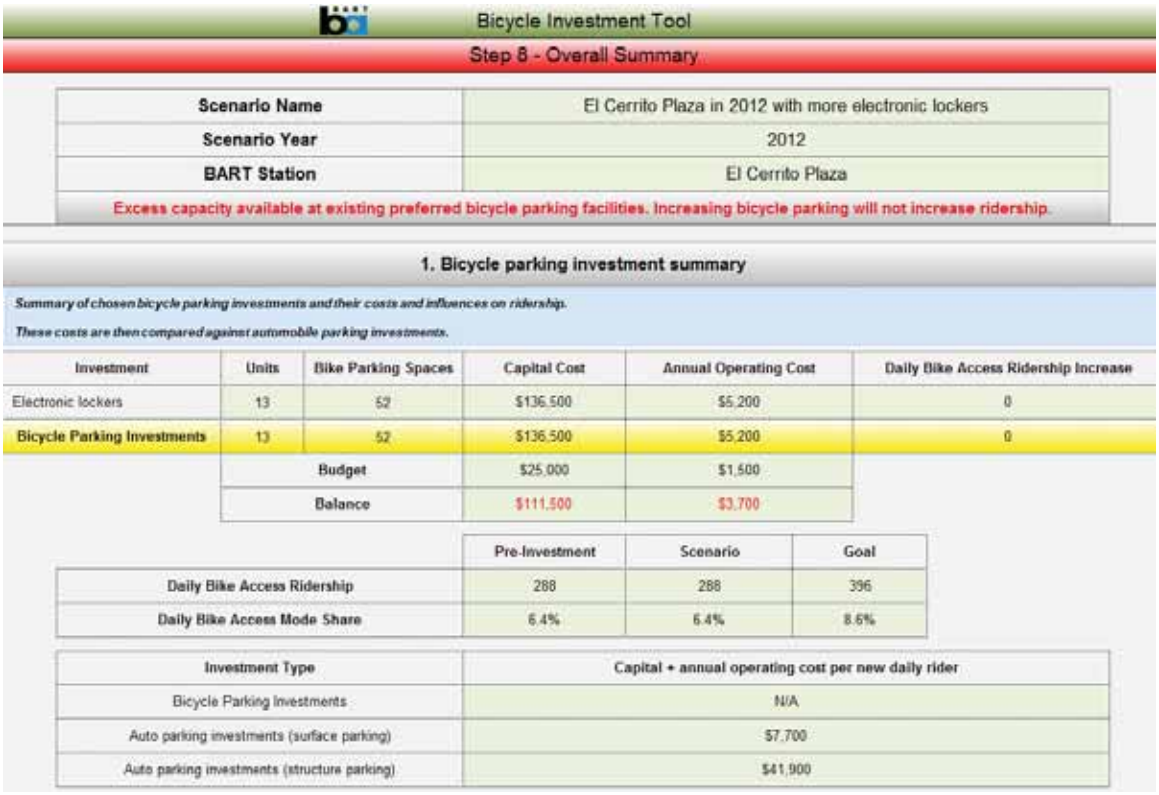
Strategy	Include?	Scope
High Priority		
Develop and install wayfinding signage	☑	Station
Optimize routes between surrounding network and fare gates	☑	Station
Evaluate and install stairway channels	☑	Station
Revisit bicycles on escalators policy	☑	Systemwide
Clean elevators regularly	☑	Station
Medium Priority		
Install additional ADA-accessible fare gates	☑	Station
Low Priority		
Install ADA-accessible fare gates adjacent to elevators	☑	Station

Step 3B - Plentiful Parking Strategies

Strategy	Include?	Scope
High Priority		
Provide adequate bicycle parking of each type	☑	Station
Light all bike parking areas	☑	Station
Maintain bicycle facilities more frequently	☑	Station
Allow Clipper payment for bike parking	☑	Station
Medium Priority		
Manage eLocker demand through price variation	☑	Station
Low Priority		

Overall Summary (Printable!)

The Overall Summary tab contains information from all of the previous tabs. The page is formatted to print out an easy-to-digest three-page handout, which presents comparisons between the chosen bicycle investment package and typical BART vehicle parking investments at stations.



Bicycle Investment Tool

Step 8 - Overall Summary

Scenario Name	El Cerrito Plaza in 2012 with more electronic lockers
Scenario Year	2012
BART Station	El Cerrito Plaza

Excess capacity available at existing preferred bicycle parking facilities. Increasing bicycle parking will not increase ridership.

1. Bicycle parking investment summary

Summary of chosen bicycle parking investments and their costs and influences on ridership.

These costs are then compared against automobile parking investments.

Investment	Units	Bike Parking Spaces	Capital Cost	Annual Operating Cost	Daily Bike Access Ridership Increase
Electronic lockers	13	52	$136,500	$5,200	0
Bicycle Parking Investments	13	52	$136,500	$5,200	0
	Budget		$25,000	$1,500	
	Balance		$111,500	$3,700	

	Pre-Investment	Scenario	Goal
Daily Bike Access Ridership	288	288	396
Daily Bike Access Mode Share	6.4%	6.4%	8.6%

Investment Type	Capital + annual operating cost per new daily rider
Bicycle Parking Investments	N/A
Auto parking investments (surface parking)	$7,700
Auto parking investments (structure parking)	$41,900

This page is printable to a printer or PDF. The page is formatted to print in three pages and can be a handy reference guide.

This release of the tool represents version 1.0. The tool was developed by Fehr & Peers, Transportation Consultants. The tool was developed by Mackenzie Watten and Brooke DuBose. Please contact Fehr & Peers for troubleshooting or general feedback.

H | Investment Tool Development History

The memorandum beginning on the following page describes the adaptation of BART's Direct Ridership Model (DRM) to forecast bicycle access. This model provides the basis for the Bicycle Investment Tool described in chapter 4.

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MEMORANDUM

Date: February 22, 2012

To: Steve Beroldo, BART

From: Mackenzie Watten and Brooke DuBose, Fehr & Peers

Subject: ***BART Bicycle Access Plan Update – BART Bicycle Direct Ridership Model Development***

SF11-0545

This memorandum describes the development of a Direct Ridership Model (DRM) for the BART Bicycle Access Plan Update[1]. The purpose of the model is to predict changes in BART bicycle access ridership by station based on station area variables, including both the physical environment and BART bicycle policies. The model is designed to rate the efficiency (measured in passengers per dollar of investment) of various investments on ridership. The development of a bicycle specific BART DRM follows the successful development of an aggregate ridership BART DRM in 2009. That model estimates total ridership at each BART station and then splits the ridership into auto, transit, and combined walk and bicycle access modes. The aggregate model is used internally at BART for ridership and operation forecasting.

The aggregate ridership BART DRM was not developed to estimate bicycle ridership. Walk and bicycle ridership were combined; the only bicycle-specific variable in the model was the total number of bicycle parking spaces systemwide. The bicycle specific BART DRM for the BART Bicycle Access Plan Update estimates bicycle ridership based on a number of station area variables, including bicycle related variables. Variables include nearby population, nearby mployment, vehicle parking, supply of bicycle parking, security and lighting of bicycle parking, BART bicycle policies, and station typology. The model predicts the number of BART riders accessing each station by bicycle each weekday. The model was developed based on BART specific data but is also generalized to five station typologies so that it may be used by transit agencies other than BART. The station typologies -- Urban, Urban with Parking, Balanced Intermodal, Intermodal-Auto Reliant, and Auto Dependent – are used by BART for other planning purposes as well. See the *BART Bicycle Investment Tool User's Guide* dated February 22, 2012 for a detailed description of each station typology.

The bicycle specific BART DRM is implemented within the BART Bicycle Investment Tool that gives the user the ability to evaluate bicycle investments at a station or system-wide level. This model is an innovative tool that will serve as a template for other transit agencies to customize and improve upon.

[1] This memorandum is accompanied by the BART Bicycle Investment Tool User's Guide, dated Feburary 22, 2012. The BART Bicycle Investment Tool is a Microsoft Excel based tool that uses the BART Bicycle Direct Ridership Model results to identify the most cost-effective bicycle investments in terms of their ability to encourage the use of bicycles as a mode of travel to and/or from BART.

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WHAT IS A DIRECT RIDERSHIP MODEL?

Direct Ridership Models transparently estimate transit ridership as a function of station area characteristics. Traditional forecasting of transit ridership within region-wide travel demand models is unresponsive to changes in station-level land use or transit service characteristics, and is buried within a complicated black box. Direct Ridership Models establish clear relationships between transit ridership and station area characteristics. For example, a DRM may estimate that transit ridership at a heavy rail station is a function of population within five miles of the station, the amount of vehicle parking at the station, and the frequency of feeder transit to the station. The DRM model estimates the influence that each station area characteristic has on transit ridership. This magnitude of influence could then be applied to stations similar to the ones used to develop the DRM.

Direct Ridership Models use multivariate regression and other statistical analyses based on local empirical data to determine the station characteristics that most influence transit patronage. These models can respond directly to factors such as station-area household and employment characteristics, vehicle and bicycle parking, feeder transit activity, street network connectivity, and the effects of transit-oriented development (TOD). Direct Ridership Models are a more efficient and responsive means of forecasting the effects of individual station activities than conventional transit patronage models. Transit ridership is traditionally forecast with region-wide travel demand models, which often represent transportation networks and land use at an aggregate scale. Such models are relatively unresponsive to changes in station-level land use and transit service characteristics. Even rarer than traditional transit ridership models are models that forecast bicycle access to rail transit.

The DRMs developed for this study predict changes in weekday bicycle access ridership at individual BART stations, based on empirical relationships found through statistical analysis of BART system ridership data, the 2008 BART Passenger Profile Survey, and the 2011 online BART Bicycle Access Survey. This is a first-of-its-kind bicycle access to transit model.

MODEL DEVELOPMENT PROCESS

The objective of developing a bicycle-specific model is to derive a series of statistically valid models capable of predicting current weekday station-specific bicycle ridership. The models are capable of responding to input changes, and are therefore able to predict changes to future bicycle access ridership.

Daily boarding models were developed for two types of bicycle access: park and ride (P&R) and board with bike (BwB). The sample sizes for P&R and BwB users from the data used to derive the models were small. In statistics, relationships between data become more accurate as more data is available for the model derivation process. To increase the accuracy of the relationships derived, the models were developed for total weekday ridership instead of for smaller time periods.

The P&R and BwB data is from the 2008 BART passenger profile survey. The survey responses included the boarding station and the mode of access to each station. BART also supplied raw ridership data from the same days on which the survey was taken. Average boardings by mode were developed from the ridership data.

Station area data was collected for 33 independent variables believed to be potentially predictive of station bicycle ridership. All of the data, with the exception of bicycle parking, street network

connectivity, and BART bicycle policy, was collected in 2008 as part of the aggregate ridership BART DRM. Additional data was collected in 2011. These variables roughly break into ten categories, as shown in Table 1.

TABLE 1
POTENTIALLY PREDICTIVE VARIABLES FOR THE BICYCLE-SPECIFIC DRM

Category	Description	Source
Population	Population within ½ mile of station	Regional travel demand models
	Catchment population	
	College population	
Employment	Retail employment within ½ mile of station	Regional travel demand models
	Non-retail employment within ½ mile of station	
Demographic	Average household income	BART Online Survey (2011)
	Average age	
Parking (Automobile)	Unreserved vehicle parking at station	Field data collection (2008)
	Reserved vehicle parking at station	
Parking (Bicycle)	Bicycle racks outside fare gates	Field data collection (2011)
	Bicycle racks inside fare gates	
	Keyed lockers	
	Electronic lockers	
	Self Serve bike station spaces	
	Attended bike station spaces	
Street Network Connectivity	Station pedestrian accessibility and design factor	Field data collection (2008) and Barajas (2011)
	Street network density	
	Intersection density	
	Connected node ratio	
	Link ratio	
Feeder Transit Service	Local buses	Regional transit agencies (2008)
	Express buses	
	Employer/College shuttles	
	Rail/ferry connections	
Bicycle Survey Data	Security of bike parking	BART Online Survey (2011)
	Lighting of bike parking	
	Signage to bike parking	

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TABLE 1
POTENTIALLY PREDICTIVE VARIABLES FOR THE BICYCLE-SPECIFIC DRM

Category	Description	Source
	Bike pathways to station	
	Street level to bike parking	
	Street level to platform	
BART bicycle policy	Blackout periods by station	BART
Station Typology	Representative station descriptions for transferability	*Access BART*, Arup (2006)

Source: Fehr & Peers, 2012.

Population and Employment

Station-related population, housing, and employment data within a half-mile radius of the BART station was developed as part of the 2008 aggregate ridership BART DRM. The data was derived with Travel Analysis Zone (TAZ) data from several regional travel demand models, including the following:

- Alameda County Transportation Commission (Alameda CTC) model
- Contra Costa Transportation Authority (CCTA) model
- San Francisco County Transportation Authority (SFCTA) CHAMP3 model
- Metropolitan Transportation Commission (MTC) model for San Mateo County[2]

The versions available for all of these models at the time of the beginning of the study used *ABAG Projections 2005* for their land use data. For each station, a set of demand model TAZs was defined from which to include land uses. For TAZs entirely within a half-mile radius from the centroid of BART stations, all of the land use was included in the station-related data. In cases where part of the TAZs was within a half-mile radius, aerial maps were examined to determine appropriate percentages of the residential and non-residential uses within each TAZ to include in the station-related data.

The extensive effort necessary to determine station area land use based on local TAZs made it possible to analyze only one radius length around each station. The half-mile was chosen, as opposed to the quarter-mile or some other distance, because it corresponds roughly to what is considered walking distance for most people, and because it has proven to be explanatory in past BART direct ridership modeling efforts, such as *Access BART* (2006). While it is beyond the scope of this project to revise that station area land use, future revisions of the bicycle model could include a distance more congruent with average bicycle trip lengths.

[2] San Mateo County does not have a recent travel demand model with greater detail than the MTC TAZ system.

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Demographics

Average household income and age were collected from the 2011 online BART Bicycle Access Survey.

Vehicle Parking

Vehicle parking data was collected as part of the 2008 aggregate ridership BART DRM. On-site parking supply was provided by BART staff, which contained information on total number of each type (free, reserved, paid, carpool, and midday) of spaces.

Bicycle Parking

Bicycle parking at all BART stations was inventoried for supply and occupancy in the spring of 2011. For each station, parking and occupancy were catalogued by type and location (in relation to the fare gates).

Street Network Connectivity

Street network connectivity measures were gathered from *Built Environment and Demographic Predictors of Bicycle Access to Transit*, Jesus Miguel Barajas, 2011. Barajas used the 2008 TIGER/Line Shapefile set from the U.S. Census Bureau to calculate the connectivity variables. Street network density is the linear length of roads per unit area. Intersection density is the number of intersections per unit area. The unit area of analysis for the report was a one mile buffer.

Feeder Transit Service

Feeder transit frequency data was collected as part of the 2008 aggregate ridership BART DRM. The data indicates the number of individual feeder transit services that access each station daily. Feeder transit include local buses, express buses and shuttles, employer / college shuttles, and connection rail or ferries.

BART bicycle policy

The percentage of daily trains that are blacked out by station was determined using the BART schedule in the spring of 2011.

Station Typology

Station typologies were identified in the *Access BART* report, Arup, 2006.

Airport stations (SFO and the future Oakland Airport Connector station) were excluded from the regression equations, because of the unique station area land uses and factors which influence ridership at those stations. The West Dublin station was excluded from the regression equations because it was not operational at the time of the 2008 station survey.

DESCRIPTION OF DIRECT RIDERSHIP MODELS

The variables chosen to be part of the final models are those listed in Table 1 that were found to be statistically significant – that is they statistically "explain" a portion of the dependent variable

(bicycle access ridership). See Table 2 for the variables shown to be significant in predicting bicycle ridership, and Table 3 for those predictive of P&R. Of those variables not found to be significant, some should perhaps be pursued for the following reasons:

- Demographics: Online survey data was used for this variable. Actual demographic data from the U.S. Census could yield a different outcome.

- Street network connectivity: Although this variable was not shown to influence bicycle ridership, perhaps bicycle network connectivity would. It is outside of the scope of this project to collect this data, but future model refinement should consider it.

The mathematical form of each model is a regression formula, with each model incorporating a subset of the variables listed in Table 1.

Two models were developed to predict P&R and BwB models. To produce the most accurate and flexible results, models were developed to first estimate total bicycle access ridership and then estimate the percentage of that total bicycle access ridership that is P&R bicycle access ridership. The difference between the total and P&R bicycle access ridership is then the estimated BwB bicycle access ridership.

Table 2 presents the total bicycle access ridership model.

TABLE 2
TOTAL BICYCLE ACCESS RIDERSHIP MODEL

Dependent Variable	**-**
Total Bicycle Access Ridership	-
Independent Variables	**Coefficient**
Population within ½ mile	0.015729
Unreserved Parking Spaces	-0.058559
Non-Blackout Percentage of Daily Trains	74.463000
Self-Service Bike Station Spaces	1.81319
Attended Bike Station Spaces	1.91460
Bike Rack Spaces	1.19245
Locker Spaces (keyed & eLocker)	1.33364

Source: Fehr & Peers, 2012.

The form of this model is

$$\begin{aligned} \textit{Total Bicycle Access Ridership} &= 0.015729 \times \text{Population Within Half Mile} \\ &- 0.058559 \times \text{Unreserved Parking Spaces at Station} \\ &+ 74.463 \times \text{NonBlackout Percentage of Daily Trains at Station} \\ &+ 0.181319 \times \text{Self} - \text{Service Bike Station Spaces} \\ &+ 0.19160 \times \text{Attended Bike Station Spaces} \\ &+ 0.119246 \times \text{Total Rack Spaces} \\ &+ 0.133364 \times \text{Total Locker Spaces} \end{aligned}$$

This model has seven independent variables, which can be interpreted as follows:

- Bicycle access ridership increases as population within half mile of the station increases
- Bicycle access ridership decreases as more unreserved vehicle parking spaces are provided
- Bicycle access ridership increases as the non-blackout percentage of daily trains increases
- Bicycle access ridership increases as the number of self-service bike station spaces increases
- Bicycle access ridership increases as the number of attended bike station spaces increases
- Bicycle access ridership increases as the number of total rack spaces increases
- Bicycle access ridership increases as the number of total locker spaces increases

Table 3 presents the percentage of total bicycle access that is P&R model. This model was developed using the natural logarithm form of the bicycle access ridership that is P&R. The natural logarithm form of the dependent variable helped to flatten out some of the extreme values and created a better performing model.

TABLE 3
PERCENTAGE OF TOTAL BICYCLE ACCESS RIDERSHIP THAT IS P&R MODEL

Dependent Variable	**-**
Log of P&R Share	-
Independent Variables	**Coefficient**
Non-Blackout Percentage of Daily Trains	-3.138000
Total Bicycle Parking Spaces	0.002193
Security of Bicycle Parking	0.647000
Lighting of Bicycle Parking	0.323000
Station Type (1-5, Urban-Auto Dependent)	0.192000

Source: Fehr & Peers, 2012.

While this model is based on the log form of P&R share, the same linear intuition applies. Larger numbers have more influence and positive coefficients meaning a positive correlation. The application of the model differs slightly. It is a two step process. It takes the form of:

$$LN(Park\ and\ Ride\ Share) = -3.138 \times \text{NonBlackout Percentage of Daily Trains at Station} + 0.002193 \times \text{Total Bicycle Parking Spaces} + 0.647 \times \text{Security of Bicycle Parking Ranking} + 0.323 \times \text{Lighting of Bicycle Parking Ranking} + 0.192 \times \text{Station Type}$$

This model has five independent variables, which can be interpreted as follows:

- Park and ride share of total bicycle access ridership decreases as blackout periods are eliminated

- Park and ride share of total bicycle access ridership increases as bicycle parking spaces increases
- Park and ride share of total bicycle access ridership increases as security and lighting of bicycle parking increases
- Park and ride share of total bicycle access ridership is higher at suburban stations as compared to urban stations

Once the log of P&R share is calculated, the value can be converted to actual P&R share by the following equation

$$\text{Park and Ride Share} = e^{\ln \text{Park and Ride Share}} \Big/ (e^{\ln \text{Park and Ride Share}} + 1)$$

ADJUSTMENTS TO REGRESSION MODELS

The previous section detailed the statistical relationships between the dependent variable (bicycle access ridership) and independent variables (BART station area and policy variables). The relationships derived produce reasonably-well performing models that connect bicycle access ridership with factors believed to influence to bicycle access ridership.

Further improvements to the model's performance will need to rely on best practices and professional judgment. This section describes potential adjustments that could be made to the bicycle access ridership model to improve the use of the model as inputs into the investment scenario planning tool. The justification for adjusting the model is based on three factors:

- **Best Practices** – The relationships derived from the models would recommend investments that do not necessarily agree with industry best practices for bicycle parking. For example, the model results would not necessarily suggest a mix of short- and long-term parking facilities.

- **Limitations of Existing Data** – The relationships were derived using data that may have been incomplete or inconclusive in terms of existing infrastructure. For example, the Downtown Berkeley and Ashby Bike Stations are relatively new and current demand may not yet have reached its potential. It is anticipated that use will increase as passengers learn about these facilities.

- **Unknown or New Types of Investments** – The relationships derived do not include any factors to predict the effect of facilities with which BART does not already have experience. For example, there is no existing data on bike cages at BART stations, though BART may want to evaluate these and other facility types in the Investment Tool.

Ultimately, a balance must be struck between the statistically derived relationships and making the model useful and flexible for evaluating future investments; however, moving away from the statistically derived relationships will decrease overall model performance.

Table 4 presents the list of bicycle investments the model is currently being designed to evaluate, the influence of each as measured by purely statistical modeling, the adjusted influence as modified with professional judgment and supporting data and literature, and the justification of the adjustment.

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TABLE 4
BICYCLE INVESTMENT INFLUENCE ADJUSTMENT

Model variable	Influence as measured by statistics	Adjusted influence	Justification
Total bicycle access ridership			
Population within ½ mile	0.015729	-	-
Unreserved Vehicle Parking Spaces	-0.058559	-	-
Non-Blackout Percentage of Daily Trains	74.463000	-	-
Self-Service Bike Station Spaces	1.81319	2.0	Existing occupancy data from relatively new bike stations may not accurately capture total potential demand (+0.2)
Attended Bike Station Spaces	1.91460	2.4	Existing occupancy data from relatively new bike stations may not accurately capture total potential demand (0.2). Other amenities such as repairs, tools, information and bike shop may also attract bicyclists (+0.3)
Bike Rack Spaces Inside Fare Gates	1.19245	1.3	The model does not account for perception of security; would expect to have higher influence than racks outside fare gates (+0.1)
Bike Rack Spaces Outside Fare Gates	1.19245	1.1	The model does not account for perception of security; would expect to have lower influence than racks outside fare gates (-0.1)
E-Locker Spaces	1.33364	-	-
Keyed Locker Spaces	1.33364	1.0	Keyed locker systems support very few users per unit of investment.
New Factor Y (example: bike cage)	N/A	2.0	Would anticipate similar level of influence as self-service bike station.

Source: Fehr & Peers, 2012.

MODEL VALIDATION

The following section details the validation of the statistically based and adjusted bicycle DRMs. This step evaluates the estimates of ridership from the DRM as compared to 2008 ridership data as well as measures of the statistical significance of the estimated model.

R-Squared

The R-squared indicator expresses how close the model comes to explaining all of the station-to-station variability in the dependent variable. For example, a perfect R-squared value of 1.0 indicates the variation in bicycle ridership among all BART stations is fully described by the model's combination of independent variables (population, employment, etc.) and their respective coefficients and constant term. It is possible to have a negative R-squared.

Percent Root Mean Squared Error (%RMSE)

The formula for %RMSE is

$$\frac{\sqrt{\sum (x_i - y_i)^2 / n}}{\sum y_i / n}$$

where x represents model predictions, y represents actual ridership, the 'i' subscripts refer to each individual station, and n is the total number of stations.

The %RMSE is an alternate measure to R-squared, which captures the same general effects, but in this case a lower value corresponds to a better model fit. Therefore, %RMSE values are inversely correlated with R-squared values; the models with the highest R-Squared generally had the lowest RMSE, and vice versa. RMSE values below 40% are generally considered good for transportation studies. Both model performance indicators (R-squared and percent RMSE) are presented in Table 3. Only the total bicycle access model (i.e., Park and Ride and Board with Bike combined) shows an RMSE under the 40% threshold. Interestingly, the non-adjusted P&R model has an identical R-squared as the combined model, although the adjusted total and P&R models show a small discrepancy. The models have an R-squared higher than 0.61, meaning more than 61% of the station-to-station variation in ridership is explained by the models' variables. While the R-squared values could stand to be higher, the models did indicate significant influences between the independent variables (station area variables and BART policies) and the dependent variable (bicycle access ridership).

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TABLE 3
MODEL PERFORMANCE

Model	R-Squared	RMSE
Total Bicycle Access Ridership		
Non-Adjusted		
All Stations	0.79	35%
Adjusted		
All Stations	0.76	37%
Park and Ride (P&R) Bicycle Access Ridership		
Non-Adjusted		
All Stations	0.79	46%
Adjusted		
All Stations	0.72	53%
Board with Bike (BwB) Bicycle Access Ridership		
Non-Adjusted		
All Stations	0.62	47%
Adjusted		
All Stations	0.61	47%

Source: Fehr & Peers, 2012.

NEXT STEPS

The BART bicycle DRM can be used to determine the efficiency of different station or system-wide strategies to increase bicycle ridership to transit. Combined with cost estimates for the various strategies, the DRM will be used as an investment scenario tool to evaluate the costs and benefits of bicycle access improvements at stations. While the DRM was developed using BART specific data, BART station typologies allow for the tool to be easily transferrable to other heavy rail transit operators. Other transit agencies with "station-like" infrastructure, such as light rail, commuter rail, or BRT may also be able to use this model. It is advised that all parties who wish to use this model perform a local validation of the model to their own bicycle access ridership to ensure that the model performs adequately for their situation.

This model represents one of the first attempts to estimate bicycle access to transit. As a pioneer, there were limitations in the quantity and quality of data needed for model development. Further refinements and enhancements of the model will be necessary to improve performance. The following steps should be considered during the next Bike Plan update, BART aggregate DRM update, or at a later date.

Update existing data

The BART Bicycle Investment Tool, which incorporates the BART Bicycle DRM, uses bicycle parking facility stated preference survey and bicycle parking occupancy data to help constrain the

outputs of the BART Bicycle DRM. Bicycle parking facility stated preference data should be included in the next BART Passenger Survey in addition to adding bicycle focused questions from the 2011 online survey conducted as part of this project. Detailed bicycle parking occupancy data should be collected by time of year, week, and day. The data collected for this project was limited to one observation at mid-day (assumed peak occupancy) at each station.

The bicycle parking facility stated preference data should be compared to the observed preference data (bicycle parking occupancy data) to ensure that there is no stated bias.

Evaluate model performance

Before and after studies of BART bicycle investments and policy changes should be performed to compare against relationships established by the BART Bicycle DRM. In addition, review of before and after studies from other similar transit agencies should be conducted. Efforts should be made to track and review other efforts to model bike access to transit.

Incorporate new data sources

As a first-of-its-kind bicycle access to transit model, there were limitations in the quantity and quality of data needed for model development. Certain variables were shown to not be significant in estimating bicycle access ridership when it was expected they would be. Street network connectivity, bicycle network connectivity, and physical space constraints at stations should be explored for inclusion in future iterations of the model.

Existing data on bike stations is limited. Carefully review new data concerning bike stations as users become more familiar and comfortable with them.

Data on bicycle parking facilities that do not currently exist at BART stations should be explored. Examples include bike share, bike cages, and stair channels. Other technologies may emerge in the future that should be included for consideration.

Expand Bike Model

The bike model represents the first iteration of a model that will evolve over time. As the model is used there may be different requests for functionality to be built into the model. The following represents the current ideas for evolution of the model

- Bike egress model
    - The current model is for bike access only. Consider adding an egress model
- Increase catchment area variables (such as population, employment) beyond ½ mile radii
    - Expand the catchment area variables to a radii more consistent with appropriate bike access catchment area
- Understanding mode shifts
    - Distinction between attracting new riders versus retaining existing riders
    - Distinction between attracting new riders to BART system versus shifting of existing BART riders from other modes
        - Current model assumes all increases in bike access ridership are new riders to the BART system. This is a conservative estimate in terms of bicycle mode share but not conservative in terms of BART revenue
- Connect BART Bicycle DRM to BART Aggregate DRM
    - Perhaps as part of next BART Aggregate DRM development

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APPENDIX A

Significance level of variables and intercept

The following tables show the parameter and significance level for each independent variable and intercept for each of the models highlighted above.

Total Bicycle Access Ridership

TABLE A-1
TOTAL BICYCLE ACCESS RIDERSHIP MODEL SIGNIFICANCE LEVEL

Independent Variables	Coefficient	Significance Level
Population within ½ mile	0.015729	99.9%
Unreserved Parking Spaces	-0.058559	94.4%
Non-Blackout Percentage of Daily Trains	74.463000	84.6%
Self-Service Bike Station Spaces	1.81319	99.8%
Attended Bike Station Spaces	1.91460	99.9%
Bike Rack Spaces	1.19245	99.2%
Locker Spaces (keyed & eLocker)	1.33364	69.5%

Source: Fehr & Peers, 2012.

Park and Ride Share

TABLE A-2
PERCENTAGE OF TOTAL BICYCLE ACCESS RIDERSHIP THAT IS P&R MODEL

Independent Variables	Coefficient	Significance Level
Non-Blackout Percentage of Daily Trains	-3.138000	99.9%
Total Bicycle Parking Spaces	0.002193	80.0%
Security of Bicycle Parking	0.647000	90.7%
Lighting of Bicycle Parking	0.323000	59.1%
Station Type (1-5, Urban-Auto Dependent)	0.192000	98.4%

Source: Fehr & Peers, 2012.

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APPENDIX B

Model Data Inputs

Table B-1 contains the input variables used to create the models above.

TABLE B-1
MODEL INPUT DATA

Station	Population within ½ mile	Unreserved Vehicle Parking	Non-blackout percentage	Self serve bike station spaces	Attended bike station spaces	Total Rack Spaces	Total Locker Spaces	Total Bike Park	Security of Bicycle Parking Rating	Lighting of Bicycle Parking Rating	Station Type
12th St Oakland	5,816	0	99%	0	0	0	8	8	0.69	1.11	1
16th St Mission	23,581	0	88%	0	0	77	0	77	0.74	1.43	1
19th St Oakland	10,907	0	73%	0	0	66	8	74	0.91	1.50	1
24th St Mission	25,174	0	89%	0	0	70	0	70	0.72	1.42	1
Ashby	9,072	440	94%	128	0	136	24	288	1.43	1.68	2
Balboa Park	9,518	0	90%	0	0	88	0	88	0.93	1.58	2
Bayfair	6,822	1,551	96%	0	0	42	16	58	0.67	0.87	3
Castro Valley	3,069	922	95%	0	0	20	0	20	0.76	1.06	5
Civic Center	22,299	0	80%	0	0	63	0	63	0.55	1.07	1
Coliseum	2,404	918	92%	0	0	63	0	63	0.17	0.75	3
Colma	4,369	785	95%	0	0	40	0	40	1.75	1.25	4
Concord	7,819	2,255	92%	0	0	119	16	135	0.44	1.07	5
Daly City	9,326	1,511	90%	0	0	49	20	69	0.75	0.81	4
Downtown Berkeley	9,664	0	97%	113	155	0	0	268	2.04	2.02	1
Dublin/Pleasanton	338	2,421	95%	0	0	78	12	90	0.84	1.14	5
El Cerrito Del Norte	4,662	2,006	97%	0	0	126	0	126	0.56	1.19	4
El Cerrito Plaza	5,189	568	97%	0	0	94	48	142	1.55	1.57	3
Embarcadero	3,398	0	77%	96	0	0	0	96	1.26	1.47	1
Fremont	3,369	1,506	97%	0	0	121	0	121	0.72	1.24	4
Fruitvale	9,355	518	92%	0	200	49	0	249	1.85	1.85	3
Glen Park	8,391	0	90%	0	0	49	0	49	1.14	1.61	2

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TABLE B-1
MODEL INPUT DATA

Station	Population within ½ mile	Unreserved Vehicle Parking	Non-blackout percentage	Self serve bike station spaces	Attended bike station spaces	Total Rack Spaces	Total Locker Spaces	Total Bike Park	Security of Bicycle Parking Rating	Lighting of Bicycle Parking Rating	Station Type
Hayward	4,295	1,354	97%	0	0	70	0	70	0.80	0.78	3
Lafayette	1,674	1,119	80%	0	0	64	0	64	0.85	1.52	5
Lake Merritt	4,453	83	92%	0	0	21	32	53	0.88	1.23	2
MacArthur	9,040	362	88%	0	0	126	40	166	0.94	1.08	3
Millbrae	1,561	2,466	95%	0	0	40	0	40	0.89	1.27	5
Montgomery	7,605	0	72%	0	0	0	0	0	0.67	1.13	1
North Berkeley	9,115	595	97%	0	0	151	48	199	1.15	1.39	2
North Concord	3,303	1,870	93%	0	0	60	0	60	0.86	1.13	5
Orinda	550	1,022	80%	0	0	26	8	34	1.20	1.60	5
Pittsburg Bay Point	1,985	1,708	94%	0	0	24	0	24	0.67	0.93	5
Pleasant Hill	4,525	2,416	90%	0	0	224	24	248	0.97	1.12	5
Powell	16,423	0	72%	0	0	7	0	7	0.36	0.81	1
Richmond	7,468	693	97%	0	0	42	16	58	0.70	0.78	3
Rockridge	6,095	457	80%	0	0	133	32	165	0.95	1.26	3
San Bruno	1,916	733	95%	0	0	18	0	18	0.50	2.00	5
San Leandro	5,591	1,077	92%	0	0	93	32	125	1.28	1.24	3
South Hayward	4,304	1,005	97%	0	0	56	0	56	0.67	0.83	5
South San Francisco	3,653	1,247	95%	0	0	30	0	30	0.71	1.14	5
Union City	4,936	896	97%	0	0	8	20	28	0.62	1.15	4
Walnut Creek	3,677	1,733	80%	0	0	91	16	107	0.60	0.93	4
West Oakland	5,417	719	84%	0	0	91	26	117	0.33	0.77	4

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APPENDIX C

Model Outputs

Table C-1 contains the outputs of the model using the data used to derive the model.

TABLE C-1
MODEL BASE OUTPUTS

Station	Predicted total bicycle access ridership	Predicted P&R ridership	Predicted BWB ridership	Observed total bicycle access ridership	Observed P&R ridership	Observed BWB ridership	Predicted – Observed total bicycle access ridership	Predicted – Observed P&R ridership	Predicted – Observed BWB ridership
12th St Oakland	176	19	157	162	61	101	14	-42	56
16th St Mission	529	98	430	644	143	501	-115	-45	-71
19th St Oakland	315	94	221	232	85	147	83	9	74
24th St Mission	546	98	448	518	227	291	28	-129	157
Ashby	613	238	374	540	203	337	73	35	37
Balboa Park	322	78	244	318	42	275	4	36	-31
Bayfair	160	27	133	130	26	104	30	1	29
Castro Valley	89	22	67	84	15	69	5	7	-2
Civic Center	485	91	394	580	107	472	-95	-16	-78
Coliseum	128	18	110	145	14	130	-17	4	-20
Colma	141	50	91	22	11	11	119	39	80
Concord	223	60	163	226	58	168	-3	2	-5
Daly City	211	50	160	70	21	49	141	29	111
Downtown Berkeley	726	311	415	585	272	313	141	39	102
Dublin/Pleasanton	43	12	31	178	43	135	-135	-31	-104
El Cerrito Del Norte	178	40	139	240	71	168	-62	-31	-29
El Cerrito Plaza	297	102	195	285	150	135	12	-48	60
Embarcadero	285	93	192	548	74	473	-263	19	-281
Fremont	182	44	138	118	33	85	64	11	53
Fruitvale	627	318	309	736	286	450	-109	32	-141
Glen Park	257	66	192	164	55	109	93	11	83
Hayward	144	25	119	123	31	92	21	-6	27

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TABLE C-1
MODEL BASE OUTPUTS

Station	Predicted total bicycle access ridership	Predicted P&R ridership	Predicted BWB ridership	Observed total bicycle access ridership	Observed P&R ridership	Observed BWB ridership	Predicted – Observed total bicycle access ridership	Predicted – Observed P&R ridership	Predicted – Observed BWB ridership
Lafayette	96	40	57	80	38	42	16	2	15
Lake Merritt	201	39	162	346	61	285	-145	-22	-123
MacArthur	390	116	274	560	150	410	-170	-34	-136
Millbrae	0	0	0	55	18	36	-55	-18	-36
Montgomery	173	38	135	280	12	268	-107	26	-133
North Berkeley	425	112	313	339	158	181	86	-46	132
North Concord	83	24	60	22	7	15	61	17	45
Orinda	50	23	27	62	29	33	-12	-6	-6
Pittsburg Bay Point	30	7	23	43	14	28	-13	-7	-5
Pleasant Hill	296	123	173	335	122	212	-39	1	-39
Powell	320	56	265	242	48	194	78	8	71
Richmond	220	36	185	143	12	131	77	24	54
Rockridge	330	121	209	242	64	178	88	57	31
San Bruno	79	21	58	74	16	58	5	5	0
San Leandro	247	76	171	249	31	218	-2	45	-47
South Hayward	148	32	116	156	13	143	-8	19	-27
South San Francisco	91	22	69	32	12	20	59	10	49
Union City	134	25	108	83	10	73	51	15	35
Walnut Creek	146	45	101	153	71	82	-7	-26	19
West Oakland	249	59	190	290	75	215	-41	-16	-25

11 Potential Funding Sources

	County Transportation Authorities (1)				Regional				State	Federal		
Project Type	San Francisco (2)	Alameda	Contra Costa (3)	San Mateo	TDA Article 3 (4)	TFCA (5)	SR2T / Measure 2 (6)	Station Area Planning Grant (7)	Bicycle Transportation Account	Future Federal Stimulus or Transportation Enhancements	SRTS (8)	STP and CMAQ (9)
Secure bicycle parking at transit	X	X		X	X	X	X	X	X	X	X	X
Construction / Engineering capital project e.g. roadway widening, bike lanes and multi-use paths, shoulder paving, restriping, bike bridge.	X	X	X	X	X	X	X		X	X	X	X
Hazard elimination or improvement e.g., substandard grates or culverts	X	X		X	X		X		X			
Maintenance of non-motorized bikeways	X	X	X		X				X			
Facilitation of bicycle-transit trips	X	X	X	X	X	X		X	X	X	X	
Traffic control devices to improve bicycle travel	X	X					X		X	X		
Adjustment of traffic-actuated signals to be bike-sensitive	X				X	X	X		X	X		
Development or update of a Bicycle Master Plan or bicycle access plan element			X		X (10)							
Bicycle Promotion Program	X	X		X		X						X
Bicycle Safety Education Program	X	X			X (11)						X	

(1) All county funding includes Regional Lifeline funds (for projects addressing transportation gaps and transportation choice for low-income populations identified in CBTPs or collaborative planning process)
(2) San Francisco funding includes Proposition K and Proposition AA funds
(3) Contra Costa County funding includes Measure J funds
(4) Transportation Development Act, Article 3 (Bicycle and Pedestrian programs)
(5) Transportation Fund for Clean Air, administered by Bay Area Air Quality Management District
(6) Safe Routes to Transit, funded by regional Measure 2 and administered by Metropolitan Transportation Commission, TransForm and East Bay Bicycle Coalition
(7) Bicycle access must be part of a city-sponsored station area land use plan in a Priority Development Area (PDA)
(8) Safe Routes to Schools grants. SRTS funding must increase bicycle and pedestrian access within 2 miles of a school; administered by different agencies in each county
(9) Surface Transportation Program and Congestion Mitigation & Air Quality Improvement Program, will be replaced by OneBayArea program in 2012 - www.mtc.ca.gov/funding/onebayarea
(10) Limited to once every five years
(11) Up to 5% of county's TDA Article 3 funds, 50% match required where county policy supports use of funds for this purpose

Links to funding sources online

County Transportation Authority Funds

- San Francisco: www.sfcta.org/content/section/3/8/
- Alameda: www.alamedactc.org/app_pages/view/1701
- Contra Costa: www.ccta.net/EN/main/about/measurej.html
- San Mateo: http://www.smcta.com/pedestrian_and_bicycle_program.html

Regional

- TDA Article 3: www.mtc.ca.gov/funding/STA-TDA
- TFCA: http://www.baaqmd.gov/Divisions/Strategic-Incentives/Funding-Sources/TFCA.aspx
- SR2T / Measure 2: www.transformca.org/campaign/sr2t
- Station Area Planning Grant: http://www.mtc.ca.gov/planning/smart_growth/stations/

State

- Bicycle Transportation Account: www.dot.ca.gov/hq/LocalPrograms/bta/btawebPage.htm

Federal

- SRTS: Alameda: http://transformca.org/sr2s; Contra Costa: www.street-smarts.com/index.htm or http://cchealth.org/groups/prevention/; San Francisco: www.sfsaferoutes.org; San Mateo: www.ccag.ca.gov/pdf/plans-reports/2012/San%20Mateo%20County%20SR2S%20Program%20Guide_Final_Low%20Res.pdf
- STP and CMAQ: www.mtc.ca.gov/funding/STPCMAQ